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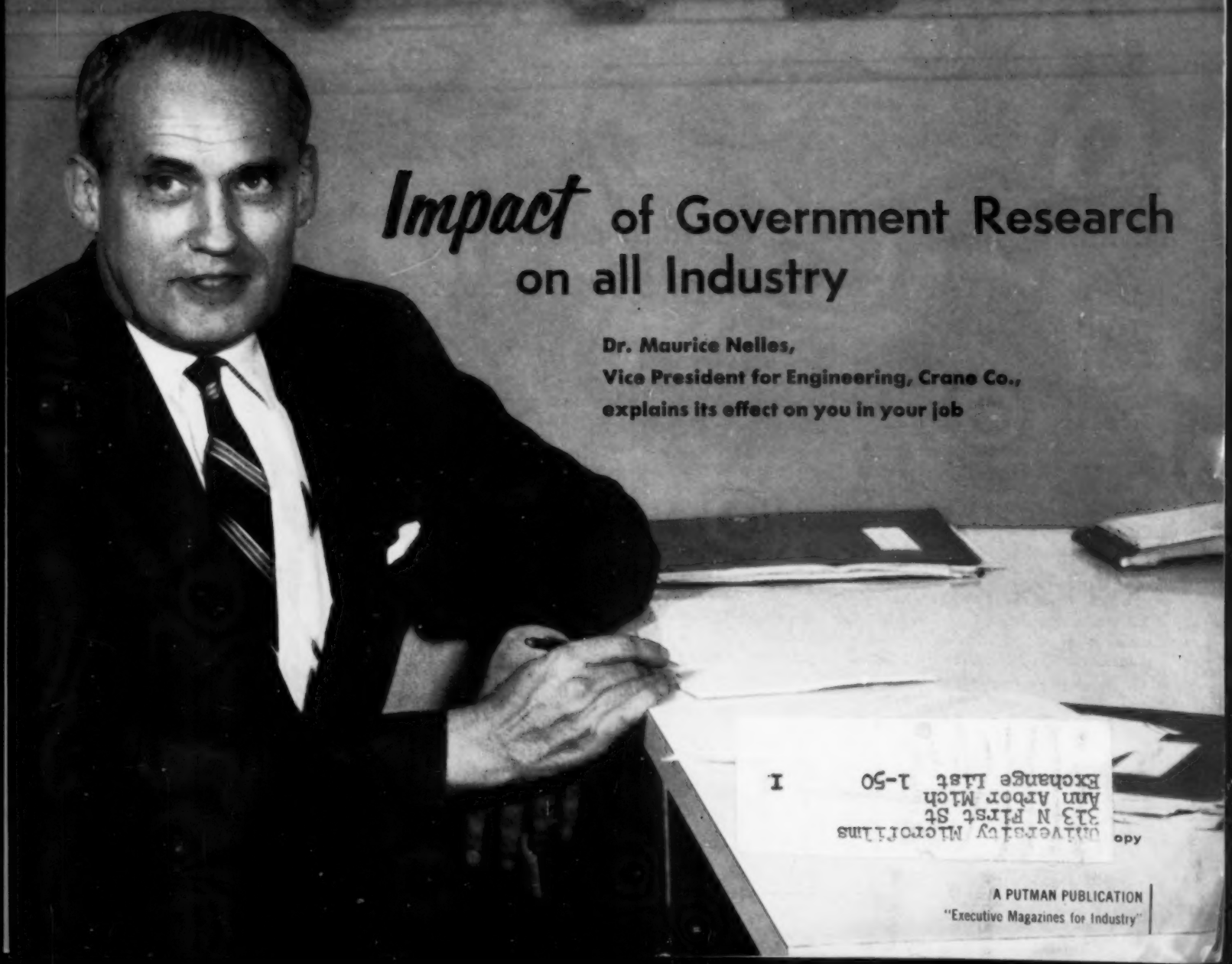
DECEMBER 1958

In this issue: — over 40 reports of technical developments in plant and power services

POWER INDUSTRY

PLANT & POWER SERVICES



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Dec. 1-3: American Society of Refrigerating Engineers; Roosevelt Hotel, New Orleans, La.

Dec. 1-4: National Warm Air Heating and Air Conditioning Association; Cleveland, Ohio.

Dec. 1-5: ASME 23rd National Exposition of Power and Mechanical Engineering; New York Coliseum, New York, N.Y.

Dec. 3-5: 1958 Eastern Joint Computer Conference; Philadelphia, Pennsylvania.

Dec. 8-10: American Nuclear Society; Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 7-10: American Institute of Chemical Engineers; Annual Meeting; Netherlands-Plaza Hotel, Cincinnati, Ohio.

Jan. 25-29: AED 40th Annual Meeting; Conrad Hilton Hotel, Chicago, Ill.

Jan. 26-29: ASHAE 65th Annual Meeting; Commercial Museum, Philadelphia, Pa.

Jan. 26-29: Plant Maintenance & Engineering Show; Public Auditorium, Cleveland, Ohio.

Jan. 26-29: 14th International Heating & Air Conditioning Exposition; Convention Hall, Philadelphia, Pa.

Feb. 12-13: 1959 Solid State Circuits Conference; Philadelphia, Pennsylvania.

Feb. 16-19: Industrial Ventilation Conference; Kellogg Center for Continuing Education, Michigan State University, East Lansing, Mich.

Mar. 16-20: National Association of Corrosion Engineers, National Meeting; Sherman Hotel, Chicago, Ill.

Apr. 5-9: Edison Electric Institute, Annual Convention; New Orleans, La.

Apr. 6-10: 1959 Welding Show, 40th Annual Convention; Hotel Sherman and International Amphitheatre, Chicago, Ill.

Apr. 29-May 4: Oil-Heat Institute of America, Inc.; Seattle, Wash.

May 5-6: Interdisciplinary Conference on Self-Organizing Systems; Museum of Science and Industry, Chicago, Ill.

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QUALIFIED READER SUBSCRIPTIONS are accepted without charge from selected executives and engineers who manage plant and power services in plants and organizations. Subscriptions are accepted from "non-qualified" people—i.e., those whose job responsibilities are not within the orbit of management as described above—at $1.00 the copy; $10.00 the year in U.S.; $15.00 outside U.S. Note: Such subscriptions are available only as an accommodation and in response to specific request. They are not counted as "industry circulation" on BPA Audit Reports. Accepted as controlled circulation publication at Mendota, Ill., 1501 W. Washington Rd.

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December 1958

VOL. 74 No. 12

POWER PLANT & POWER SERVICES INDUSTRY

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IN THIS ISSUE

9 **Wet approach to solving air flow problems**

Buell engineers have come up with a simple "bathtub" device for predicting air flow patterns and solving problems before they happen

10 **Impact of Government research on all industry**

New techniques and processes which have come out of Government's research programs call for new thinking in plant and power services

12 **Repair the easy way**

Bahamas Electricity literally glued back together corroded sections of a diesel engine. By using a steel-plastic paste, it handled what might have been a costly repair job for under $10

14 **A DC power source that thinks fast**

GE design engineer discusses a new breed of motor-generator sets with built-in reflex actions

16 **Device easily strips away insulation from conductors**

MONTHLY FEATURES

2 Conventions & Exhibits
4 Reports in Brief
7 Letters
16 New Developments
24 New Literature
25 Engineering Data
31 Photo News

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Circle 9259 opposite covers.

REPORTS IN BRIEF

This boiler scale removal technique reduces downtime considerably

Development of a technique for hydroxy apatite boiler-scale removal reduces downtime as much as 30 hours for high make-up industrial boiler cleaning.

Technique makes use of chelating agents which are introduced into blower system as a water solution and circulated at low pressures until reaction is complete.

This technique applied to industrial boilers has resulted in a boiler which is 80 to 90 percent bare metal clean.

In operation, pressures are first reduced to 150 psig. High temperatures — not to exceed 400°F — are maintained on the boiler for a period of 6 to 24 hours, with recirculation and periodic blowdowns.

Proper pH adjustment is an important factor in getting best results. A pH range of 7.5 to 8.0 appears to be most desirable. The Dow Chemical Co. — who developed the technique — uses Versene 100 as a chelating agent and Versene acid for pH adjustment.

Condensate water is used for dilution. For each 1000 gal of boiler volume, a minimum of 150 lbs of Versene 100 to 21 lbs of Versene Acid are recommended. Proper solution of the chemicals is important.

Solution is pumped directly to boiler through chemical feed pumps. Dilution occurs in boiler which needs to be drained only to permit full addition of the chemicals. Heat can be maintained on boiler to produce highest temperature possible — but not more than 400°F.

After solution has been introduced into the boiler, periodic sampling from the blowdown lines should be made at half hour or hour intervals. Samples are analyzed for unused chelating agent by use of the calcium oxalate titration method.

Cleaning solution can then be drained through regular sewer, providing there is not activated sludge system in operation.

Some residual effect remaining from the chelating agents used apparently reduces the amount of future scale buildup.

(Technical information and bulletin on method are available from The Dow Chemical Co., Dept. PI, Midland, Mich.) Circle 9260 opposite covers.

Develops vapor systems for transformer cooling

Westinghouse has announced the installation of a power transformer incorporating a fluorocarbon vapor cooling and insulating system.

Use of fluorocarbons — a class of compounds commonly used as refrigerants — offers some distinct advantages. First of all, excellent cooling characteristics of the vapor are obtained.

In addition, it has been found that the insulating properties of the material are superior to any other gaseous medium tried so far.

The fluorocarbon material is also nontoxic, explosion-proof and fireproof. Consequently, in such installations where other cooling mediums might present fire hazards, the need for expensive fireproofing and fire-extinguishing systems is eliminated.

Principle behind the use of this cooling medium is simple. Fluorocarbon liquid is distributed over the transformer coils and core by a pumping arrangement. The liquid vaporizes on contact with the warm core and coils and absorbs the heat in the vaporization process.

Hot vapors then enter a cooling system in which the heat is removed. The vapor

condenses back into a liquid, completing the heat transfer cycle.

Here are the specifics on the transformer installed at the Havre de Grace substation of the Baltimore Gas & Electric Company: Rated at 7500 kva, the transformer is capable of operating under overload conditions at 10,000 kva when additional cooling capacity is provided through use of external fans.

It will be used to step down voltage from 33 to 4.4 kv. Unit has been designed with a basic impulse level of 200 kv.

High-voltage power shown in film

Demonstrating modern methods and application of high-voltage power equipment, a color-sound movie is available for exhibiting by Delta-Star Electric Division, H. K. Porter Company, Inc.

The 16-mm film has a running time of 25 minutes and begins by comparing the opening of the world's first commercial electric power plant with the world's first commercial atomic power plant at Shippingport.

More patents released by AEC

Descriptions of 83 patents owned by the US Government and held by the Atomic Energy Commission have been released by the Commission.

This brings to a total of 1531 the number of Commission-held patents and patent applications released for licensing.

The Commission will grant non-exclusive, royalty-free licenses on the listed patents.

Of those patents listed for release, the following may be of interest: Pump for Gaseous Working Fluid (No. 2456, 133); Electrical Protective Device (No. 2,833,965); Corrosion Inhibition (No. 2,837,474); and Control and Vault Detector Circuit (No. 2,829,316).

Power from waste

In an all-day meeting, The Metropolitan Sanitary District of Greater Chicago officially unveiled a waste disposal process that generates its own power. It has been operating on a pilot-plant scale for a little over a year.

Developed by F. J. Zimmermann, president, Salvo Chemical Corporation, the process uses the "wet" combustion method to dispose of organic wastes, and at the same time to generate enough heat to make the process self-sufficient — and, in most cases, supply enough excess steam for other energy uses.

Essentially this is the process: Organic sludge is mixed with compressed air and pumped through a series of heat exchangers into a reactor where the mixture is oxidized. The mixture then enters the bottom of the reactor and is oxidized as it passes upwardly through a coarsely baffled path in the central body of the reactor.

The resultant gases and water spill through a vent at the top of the inner shell into the space between that shell and the outside walls of the reactor.

The combustion is flameless and gives off saturated steam at about 500°F. The steam is separated from the gases, recirculated back through heat exchangers and used to run the turbine for the air compressors or for other uses as needed.

The result is an odorless, low-oxygen-demand effluent.

If, and when, the Sanitary District builds a full-scale plant, it will be used to handle increased loads. Besides eliminating the large and bulky waste disposal equipment (the process requires very little space comparatively speaking), the Sanitary District expects such a plant to supply a majority of their power needs.

Although the Zimmermann Process has been piloted in several plants in this country, the first major installation is being built in Norway and should start operating at the first of the year.

RAMBLINGS ON INSTRUMENTATION

The Mysterious East

(It's-a-Small-World Division)

(Mr. Sprague and beard have recently returned from a visit to the U.S.S.R. with the Automatic Control Delegation. Herewith, some ramblings from the borscht circuit.)

Subway reading, Moscow style.

The other day, when a group of us were on the way to the Hotel Ukraine via the Moscow subway, we ran into a serious type pouring over a volume 'midst the swaying bodies. Intrigued by his concentration, we asked through our interpreter, what he was reading. The reply: a book on Automatic Control and Cybernetics. Knowing that no one would believe us, we snapped the above photo.

Seriously, this incident symbolizes the intentness with which the Soviet appears to be focusing on the theory and application of instrumentation and control devices. It was my impression that their technology is moving rapidly and is not a "house of cards"; rather it is soundly based on rigorous training in theory and application, as well as continuing emphasis on the fundamental standards which are the cornerstone of all science.

While ours was but a fleeting (and Soviet-selected) glance at an enormous country, I got the impression that—borrowing heavily from German and American designs—the Russians have built an instrument and control industry which, with a few old Lend Lease exceptions, is supplying their plant requirements.

It would appear that the focus will continue to be on producing relatively standard instruments in large quantities to meet the tremendous demand created by their 5-year plans for rapid industrialization of the country. We were told that they anticipate the instrument and control industry to increase 2.8 times between 1956 and 1960.

But we got more than a hint of their relatively new interest in foreign markets. China, Czechoslovakia, India, Argentina and 26 other countries were mentioned. Using their hole cards of, (a) concentrating large volume production of a single item in a single plant and, therefore, achieving rapidly decreasing costs and, (b) arbitrary manipulation of their exchange rates, the U.S.S.R. can be expected to be a rugged competitor on the international automation scene very soon.

Should we shudder? *No*, but I do think we should supplement the drive or motivation (which has become rather jaded of late) toward conspicuous consumption of washers, dryers, TV sets, et al, with a more individual concern for the care and feeding of our human resources. Let's face it—this is a Brains Battle and we can work out solutions for the development—*our way*—of our people of talent only if we realize it is necessary.

And, on the international competition issue, let's do more of what comes naturally; i.e. continually obsoleting products by innovation and improvement . . . constantly posing "this model is better" choices for customers here and abroad, as (commercial plug) we are trying to do here at Hays with, for example, this year's new products: the Universal Recorder, the new 245 flow transmitter, the 913 BTU Recorder and a new approach to gas sampling systems. So let's over-estimate the competition and rediscover our greatness.

Phil Sprague Jr.
President

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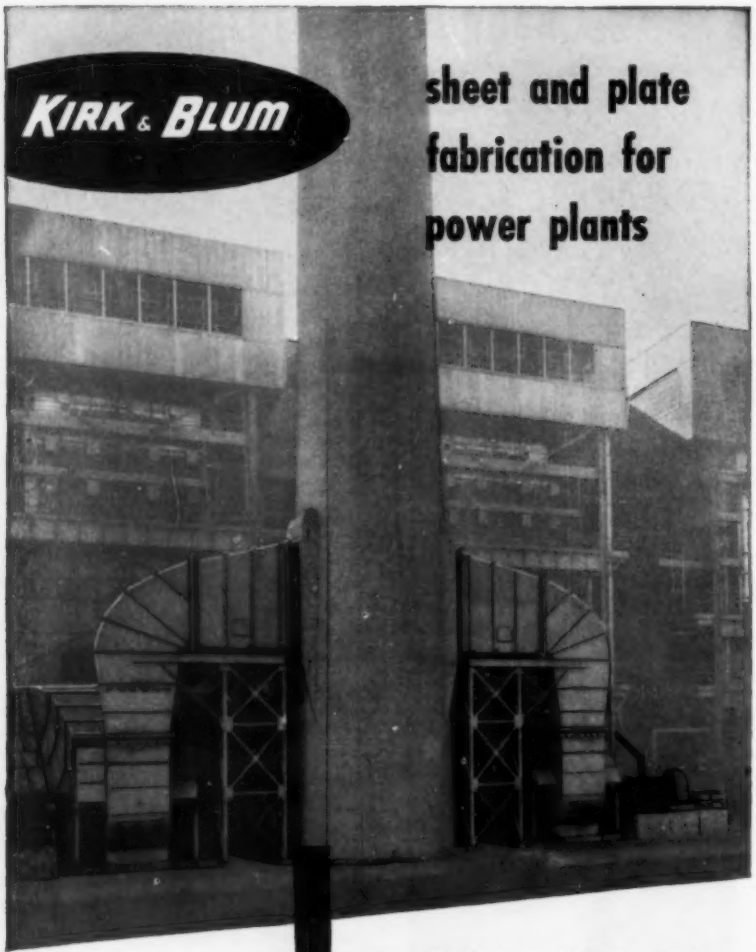

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For effective lubricating and anti-seize properties at temperatures to 1050°F, thread compound now has an improved formula which allows it to retain its homogenized consistency indefinitely, and to be non-settling, non-skinning, and non-hardening in the can.

Compound is highly adherent and will not run out or drip from vertical joints under high heat exposure.

It will not harden, shrink, crack or crumble on application, but stays flexible inside of joints. It has no deteriorating effect on piping materials.

Uses include service on threaded pipe joints, bolt studs and for coating gaskets for high temperature and high loading applications. It lubricates when making up joints and prevents seizure and galling when unscrewing.

High temperature compound is available in 4-lb (1 quart) and 1-lb (½ pint) cans.

(Anti-seize thread compound is manufactured by Crane Co., Dept. PI, 836 S. Michigan Ave., Chicago 5, Ill.)
Circle 9263 opposite covers.

Status of nuclear power

A report of the technical appraisal task force on nuclear power has been published by Edison Electric Institute.

The report is an "interim" survey and gives the status and prospects of nuclear power as of July, 1958.

The 52-page report expresses such things as the costs of nuclear power, specific technical comments on various classes of reactors, and a run down of where we stand on nuclear power.

Called EEI Publication No. 58-13, the booklet may be obtained from Edison Electric Institute, 750 Third Ave., New York, N. Y.

Its price per copy is $1.00 to member companies and employees, and $2.50 to non-member companies. Prices include mailing charges.

Back to DC?

A report made to the National Power Conference states that some engineers are looking to the use of DC power for cities in 10 to 15 years.

Though conditions "indicate no immediate justification" for a DC power program in this country, "looking ahead 10 to 15 years, some responsible engineers are logically planning for the time when DC cable may prove both practical and economical for congested metropolitan areas."

These were the remarks made in a paper prepared for presentation by three General Electric Co. engineers.

Expanding further on their beliefs, th authors state that for overhead transmission conditions in the U.S., extra high-voltage systems, rather than DC, offer best hope of reduced power transmissions costs.

However, for underground transmission, DC has "tremendous advantages" over AC in both circuit capability and transmission circuit cost per kva mile. It appears, though, that distances much greater than the present American maximum of 10 to 15 miles are necessary to offset the extra cost of space requirements of DC terminal equipment.

They point out that cable distances and transmission bottlenecks will become more and more difficult. Therefore, it is believed, that in 10 to 15 years, DC cable may prove both practical and economical.

"I'm trying to listen to one of your generators . . . do you mind?"

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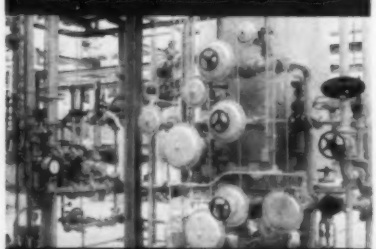
HOW TO "AUTOMATE"

BOILER FEED WATER



WITH AN ILLCO-WAY
"POWER UNIT"

These pictures show an *Automatic* Mixed-Bed De-Ionizer designed for an outdoor installation at a power plant in Louisiana. The high-pressure boilers require feed water of uniform maximum purity — which this ILLCO-WAY "Power Unit" supplies *without attention* other than periodic checks of recording instruments. ILLCO-WAY "Power Units" are shipped *completely assembled*, ready for installation and hook-up.

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Circle 9264 opposite covers.

LETTERS

Your views are welcome in this column. Address "Letters, Power Industry, 111 East Delaware Place, Chicago 11, Ill." Letters should be brief and confined to the editorial of this magazine or other topics of interest to the power services field.

Interested in outer space

Will you please give me the information on how I may acquire a copy of "Outer Space Propulsion by Nuclear Energy" which you mention on page 4 of the September 1958 issue of POWER INDUSTRY.

C. H. POPE,
Plant Engineer
Lansing, Mich.

• *Copies of "Outer Space Propulsion by Nuclear Energy" may be obtained from:*

Superintendent of Documents
Government Printing Office
Washington 25, D. C.

—The Editors

Some pressure!

We would appreciate receiving the following articles which appeared in the POWER INDUSTRY issue—October 1958.

"Pressure Drops for Steam through Valves and Fittings"
"Pressure Drops for Water through Valves"

Thank you for your cooperation.

ROBERT C. McCRAY,
Worcester Valve Co., Inc.

Please send:
"Pressure Drops for Steam"
"Pressure Drops for Water"
from October 1958 POWER INDUSTRY

B. P. HERBORT
Plant Engineer
Bell Telephone Labs.

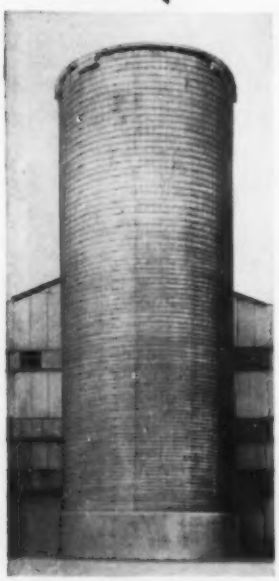
• *These are just some of the many requests we have received for copies of these nomographs.*

We would like to answer all requests, but our supply of copies have been exhausted.

— The Editors

Circle 9265 opposite covers.

It's what's INSIDE that counts!



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LETTERS

Oops! — We figured wrong

In your article on Gravity Cinder Return appearing in the October issue (page 16) we have noted an apparent confusion of figures in the paragraph reading "System decreases concentration of solids in flue gas by as much as 50 to 75% over no return at all. Recirculation of solids has been reduced by 50 to 65% over conventional return methods."

We believe this paragraph should state "With the gravity system recirculation of solids is reduced by some 50 to 65% over previous conventional return methods and concentration of solids in the flue gas is decreased accordingly."

M. J. CHURCHILL
Detroit Stoker Company

Light(n)ing strikes twice

Please send three copies of the article "How to Prevent Lighting-Off Explosions," which appeared in the July, 1958 issue of POWER INDUSTRY.

Thank you for your consideration.

W. D. ELSTON
General Design Engineer
Kaiser Aluminum & Chemical Corporation

Although I read each copy of your publication thoroughly, I somehow missed the article "How to Prevent Lighting-Off Explosions." Please send me a copy at your very earliest convenience.

V. M. WILLIAMS
Southland Paper Mills, Inc.

Please send me one copy of the article "How to Prevent Lighting-Off Explosions" which was included in the July issue of POWER INDUSTRY.

ALLAN S. JOHNSON
Supt. of Locomotive Dept.
Green Bay and Western R. R. Co.

• *Who says "Lightning doesn't strike twice." Our October issue of POWER INDUSTRY carried a letter from a reader who wanted extra copies of the article which was in the July issue.*

As a result, we have been literally flooded with similar requests, almost as many as the first bunch.

— The Editors

NON-FLUID OIL
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BEST LUBRICATION FOR MOTORS — AT LESS COST

NON-FLUID OIL keeps electric motors humming in tip-top shape because it *stays where put*—providing best lubrication at less cost per month, per year.

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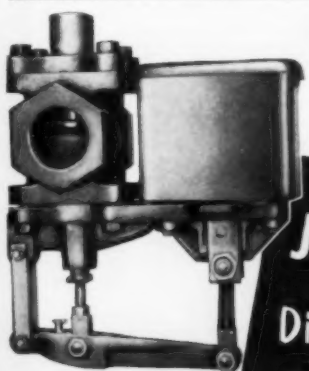

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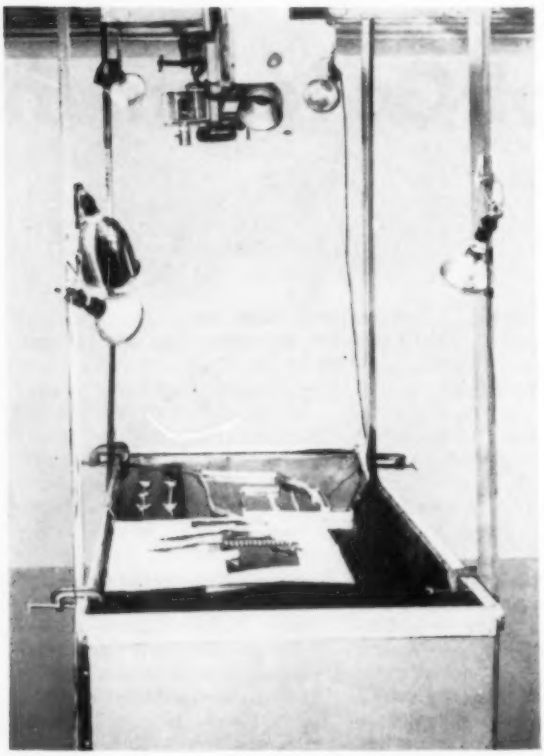


This is the "water table" set-up used to study gas-flow problems connected with various ductwork arrangements. To record results, motion pictures and time exposures are taken (note camera mounted overhead). Cardboard cut-out has been placed over flow area to focus attention on flow pattern shown in accompanying illustrations

Predicting Air Flow with a 'BATHTUB'

Flow model method uses water instead of gas stream and yields photographic evidence of how to maintain even flow through ductwork

Anyone confronted with the problem of maintaining an even air or gas flow through ductwork will be interested in the "water table" test procedure for studying the effects of inlet and outlet duct arrangements upon air flow patterns. This procedure was developed by dust collection engineers of Buell Engineering Co., Inc., to study patterns within electric precipitators.

In order to get top efficiency without prohibitive engineering costs, the company's engineers have standardized on collector designs they know will work. But duct connections to the collector have a major effect on operation.

Because each installation is different, the ducts leading to and from the collector have to be designed to meet particular space situations. Seldom are any two alike.

Hence, performance could not be known until the unit was installed, tested and modified . . . or so it seemed.

Then they began to utilize the water table system. Now all preliminary ductwork design is tested in this way before final design work is undertaken.

In this way, eighty percent of the ductwork is laid out by the customer with Buell reserving the right of final approval.

Before adapting the water table to general use, tests were conducted to check its validity. Checks with flow patterns in actual ducts and subsequent field tests indicate results are reliable.

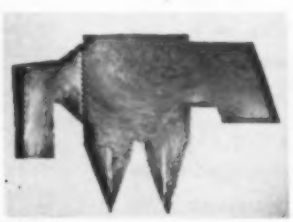
The water table consists of a 3′ x 5′ x 5″ deep "bathtub" with a water inlet at one end and an outlet at the other.

To page 13

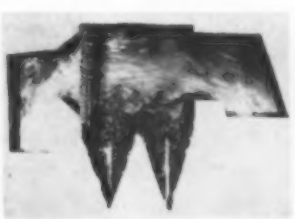
Some typical flow patterns obtained with "water table" method. To show pattern, water has been dyed blue and aluminum power is sprinkled on it at the inlet

This is duct with no baffles or vanes. Note eddy currents above hoppers

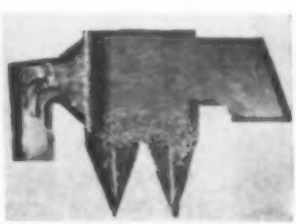
Vanes have been added with little beneficial results. Flow pattern at top of collector is worsened



Smaller downward-directed vanes improve flow above hopper but cause poor flow pattern at top of collector



Baffles give more desirable flow pattern. However, there is no flow in lower portion of collector



More desirable results are obtained by combined use of baffles and vanes

IMPACT ...of Government

DR. MAURICE NELLES
Vice President for Engineering
Crane Co.

"Stimulated by Government-financed research, there is no doubt that the new environments in which we are working — and will work — will be created and controlled in accordance with our own designs to satisfy our needs and whims," states Dr. Nelles as he describes the effect of such research on us in our jobs.

Such advances as the missile and nuclear programs have called for such major revisions in manufacturing techniques that an almost entirely new technology has been created.

In line with this, these new manufacturing processes have more stringent demands on the services that supply them with the necessary "blood." Never before has there been such emphasis on closer controls for heat, electricity, and environmental atmospheres.

The above photograph is just one of many examples of this type of thing. These men are working on valves for atomic-power propulsion applications. The valves have to be assembled in a dust-free, air-conditioned atmosphere. The workers have to wear lint-free, grease-free gloves.

To be able to give these processes the necessary environments for them to function properly, the men responsible for these services are having to meet new technology with new technology. It is important that they keep up with the trends.

The effect of Government research on American industry has been so great — and the secondary effects have been so far-reaching — that it is doubtful whether any person or group of persons could accurately evaluate the total impact.

Through the years I have derived much satisfaction from being associated actively in research activities in many fields, and usually on a pioneering basis. This includes electronics, aeronautics, atomic and molecular structure, metallurgical, chemical and oceanographic research.

Coincidently, these are the fields in which the Federal Government has spent most of the research funds which have caused the greatest impact on industry.

It has been interesting indeed to see the way in which Government research has changed crystal detectors to transistors, flying machines to guided missiles and bookkeepers to electronic computers.

How Much?

I have made an attempt to obtain an estimate of the dollars that have been spent by the Federal Government on Government research. I find this is substantially impossible because there have been no standards set in the Government as to what is research. No records have been kept which would enable one to obtain a meaningful figure.

If I were to guess, I would say somewhere between fifty and five hundred billion dollars have been spent, depending on how you define research and spend.

Those who contend research should be limited to efforts which follow unplotted courses towards unimagined goals will feel that even the fifty-billion-dollar figure is too large. Those who feel research includes the creating and building of a jet airplane or a new process to make an antibiotic may believe the five-hundred-billion figure is not large enough. There is no doubt that large sums have been spent.

The Effect

When one contemplates the impact of Government research on American industry, there is a realization that the methods of business and business organizations have changed. Some of these changes are direct and easily seen and some are indirect. Today many companies count the Government their best customer and have research contracts with

Research on American Industry

total expenditures larger than their commercial sales and sometimes more profitable.

Many small companies rely entirely on Government research for their continued existence. Usually this is special work which has filtered down through large contractors and subcontractors. Because of Government research, once insignificant companies like Lockheed, Boeing, General Dynamics and Thompson Products are now among the largest, and, in many localities, dominate the industrial activity.

The withdrawal of Government research funds from companies in Southern California would cause a disaster greater than that any earthquake has ever wrought.

The organization of business far removed from the defense equipment manufacturing business usually has a defense product division and usually this is concerned with research activities. Well known examples are General Mills, RCA, Chrysler and Crane Co.

Only the requirements of research sponsored by available Government money could entice a manufacturer of valves and plumbing ware to divert their efforts to building plants to make such interesting items as hafnium, yttrium metals and the compounds of scandium, eropium, gadolinium and others. Indeed, the impact on the nature of business activity has been great.

Benefits

The development of new processes and improving the use of old processes is one of the most important benefits which came from Government research. Tool making changed from an art to a technical procedure. Spot welding evolved to a precise process. Flash welding developed better welds than the original material.

Casting of metals became so controlled that design strengths were assured. Inert electrode welding was born. Century-old machining methods were modified so that outputs of machines were multiplied many times.

Intricate methods of investment casting were made usable. New methods of forming sheet metal, such as stretch forming, were made, and deep drawing methods were understood. Huge extrusion presses were developed.

Precision in tooling has been given new meaning and blind fastening methods have become commonplace.

As I visit industrial plants, it is easy to see the impact of work done in the aeronautical industry on the production activities in these plants. The impact of other work on processes is evident in other places, such as petroleum refineries and chemical plants.

Instruments developed through Government research have had far-reaching impact. Radar has made all-weather flying practical. Loran has made navigation simple and accurate.

Telemetering systems have found application in the petroleum and other industries. Ultra-high frequency communication systems are now used by many for industrial communications.

Measuring instruments, such as wire strain gages, are now found to be necessary for most research laboratories. Ionosphere research provided preliminary data on the ambient conditions which missiles and satellites would encounter. It seems that almost every modern instrument used now has some credit due to Government research.

The power-generation business has received many benefits from research performed with Government funds. These benefits have been both direct and indirect and include the creation of a completely new fuel for power generation. The development of atomic or nuclear energy has been discussed so extensively it will not be discussed here.

The components which have been designed for modern power-generating plants use much of the metallurgical information that was obtained for Naval vessel power plants and even some for jet and gas turbine engines.

For these applications, it has been necessary to develop metals that will operate satisfactorily at higher temperatures. The large amount of research on welding has made it possible to use these superior metals with full assurance that

To page 34

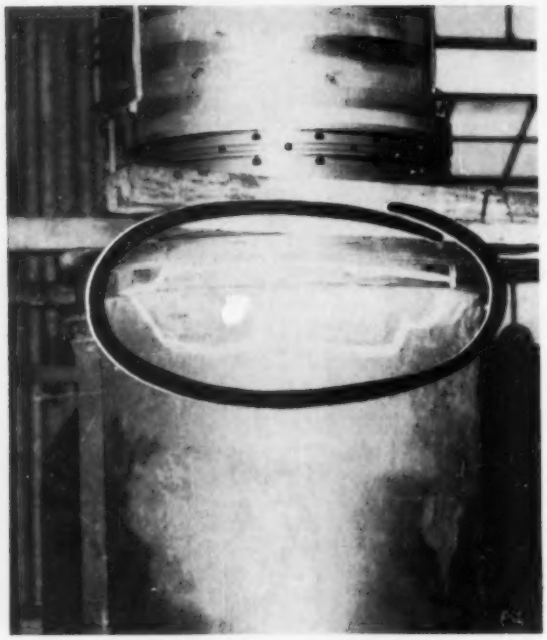
Dr. Maurice Nelles speaks with authority on the Federal Government's research program. In addition to his duties as vice president for engineering at Crane Co., he has recently been appointed president of the company's subsidiary Corwith Corporation — whose sole purpose is to handle Government-sponsored research and development work.

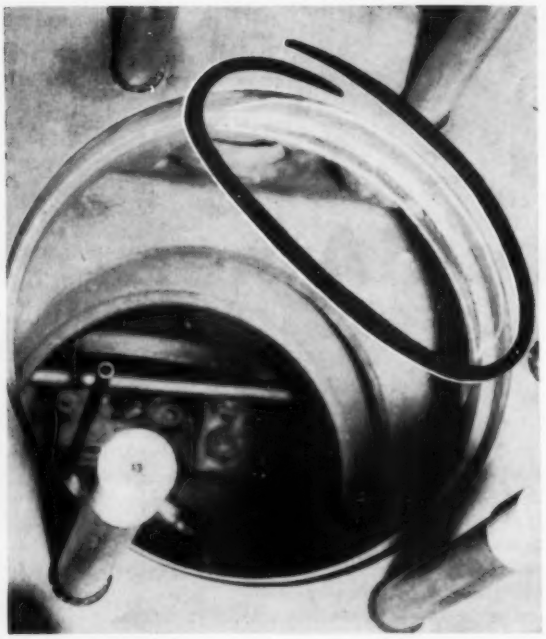
Corwith Corporation's job is to work on everything from nuclear-reactor materials development to guided missile launching systems.

Prior to joining Crane in 1957, Dr. Nelles was director of diversification and research development for Technicolor Corp. Previously he was director of research for Borg-Warner Corp., and vice president of its Petro-Mechanics Division.

Quite active in education, Dr. Nelles has been a professor at Pennsylvania State University and director of the university's engineering experimental station. He was also a professor and head of aeronautical engineering at the University of Southern California.

In Government circles, he has served as a member of the War Metallurgy Committee and the National Advisory Committee for Aeronautics. During World War II, he was deputy director of War Production Board in charge of research.



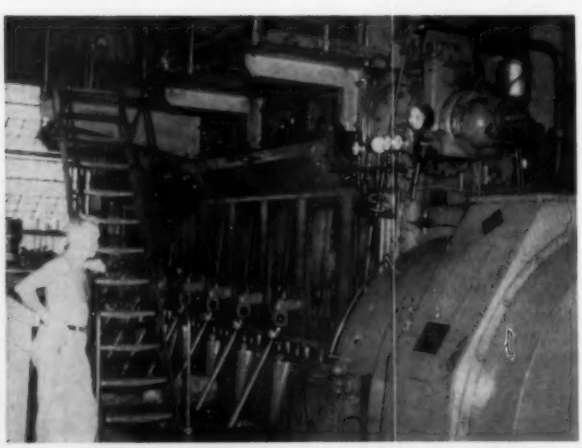


View of wet sleeve cylinder (left) and block (right) showing where corrosion had taken place and the repair job done by material made up of 80% steel and 20% plastic. Total cost of this material used in the job was under $10

When corrosion had eaten away at the sleeves and part of the block on an 8-cylinder diesel at Bahamas Electricity Corp. . .

They 'GLUED' it back together

Using a material of 80% steel and 20% plastic turned what might have been a costly job into one costing under ten dollars



This eight-cylinder diesel has been in operation for a little over a year after being repaired with a steel-plastic compound

Problem: In order to repair one of their eight-cylinder diesel engines, the Public Power Station of the Bahamas Electricity Corp. in Nassau was faced with prospects of a lengthy and costly shutdown.

Corrosion had eaten away a section of the wet sleeve of each of the cylinders as well as a part of the block itself. If at all possible, they wanted to avoid replacement because of cost involved — about $900 for each sleeve or over $100,000 for the complete block.

Although welding would seem to be the logical solution, it is not readily available on the island. Welders have to be imported from Miami. In addition to cost of paying round trip transportation, full living expenses, and wages, welding cast steel is a slow and difficult process. Estimated time for the job would have been one week.

Solution: Because of these factors, the company decided to try a material made up of 80% steel and 20% plastic. Called Plastic Steel, this compound hardens to steel strength two hours after mixing with hardening agent.

No heat, pressure, or special skill is required. It has high bonding ability with cast iron, steel, bronze, brass, and aluminum.

The eight sleeves were removed, and both the sleeves and corroded block were thoroughly cleaned. The Plastic Steel materials were applied and allowed to harden.

Surface was then ground to exact tolerances, and units were reassembled and put into operation. Two lb of Plastic Steel A and one lb of Plastic Steel B were used.

Results: The repaired diesel engine has been in operation since October 1957. The Plastic Steel repair has held up very well since that time.

The costs? Under $10 was the total cost of Plastic Steel used.

The time? Total working time was eight hours.

(Plastic Steel is manufactured by Devcon Corporation, Dept. PI, Danvers, Mass.)
Circle 9269 opposite covers.

Air Flow

From page 9

Discharged water is collected and recirculated by means of a pump.

Velocity is controlled by a valve in the one-inch inlet pipe. This valve is generally fully open. Changes in velocity do not greatly affect flow pattern, but sometimes it is desirable to study the pattern in "slow motion."

Strips of metal, two to three inches high, are arranged (on edge) on the table to form a cross section of the precipitator — to scale of about ½" or 1" to the foot.

Cross section generally represents a vertical plane parallel to flow through the precipitator.

Horizontal distribution is generally sufficiently uniform, but vertical flow can extend into collector hoppers, set up eddy currents, and travel in strata at different speeds.

After setting up the scale model, the water is turned on, and various vane and baffle arrangements are studied to determine the arrangement which will provide the best air flow pattern for the particular installation under consideration.

By trial and error, laboratory personnel have devised ways of observing flow of water. The best method found to date is to dye the water blue with ordinary bluing and then sprinkle it at the inlet with aluminum powder.

This creates an effective pattern indicating flow characteristics.

To extend the knowledge gained in the laboratory, motion pictures are taken of the various arrangements tried in solving a particular problem. Also, time exposures are taken to indicate results of various arrangements.

Technique is considerably more economical than trial and error tests in the field or even three dimensional lab tests. However, the three dimensional tests are still used for more troublesome cases.

(For more information on the "water table" method, contact Buell Engineering Co., Inc., Dept. PI, 123 William Street, New York, N.Y.)

Circle 9270 opposite covers.

WHAT'S IN A NAME?

POWER
PLANT & POWER SERVICES
INDUSTRY

- - - here's a clear-cut definition of what POWER INDUSTRY is

- **- - - whom it serves**
- **- - - whom it covers (circulation-wise)**
- **- - - whom it reaches (advertising-wise)**

Is there "a power industry"?

Can you define it? Can you clearly define the various publications in this area? . . . or in related areas? How do they compare with this specific "image" of a magazine, below?

1. **Market Served:** POWER INDUSTRY devotes itself solely and completely to serving the key men responsible for *plant and power services* throughout *all* industry, including utilities, and also in complexes of public institutions, schools, hospitals, etc.
2. **Function Served:** The function of these plant and power services is to create and maintain the environment and provide the facilities necessary to effective operation of these industries and/or buildings, regardless of variety of products manufactured or uses of buildings.
3. **Publishing Policy:** A completely unique publishing philosophy and policy . . . created by Putman Publishing Company, pioneered in CHEMICAL PROCESSING and FOOD PROCESSING . . . enables POWER INDUSTRY to serve the key men of these services with unequalled effectiveness. This unique publishing policy has been widely copied by other successful industrial magazines.
4. **Sole Objective:** POWER INDUSTRY, alone serves this specific function throughout all industry, without dilution of editorial effort, or circulation coverage, over other areas of industry. Logically, therefore, it achieves an effectiveness in this area not equalled by other publications.
5. **READER ACTION:** POWER INDUSTRY *proves* unequalled effectiveness by:
   . . . highest quality and quantity of validated readership, proved by READER ACTION.
   . . . proving highest advertising values by such READER ACTION.

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A DC Power Source that *THINKS FAST*

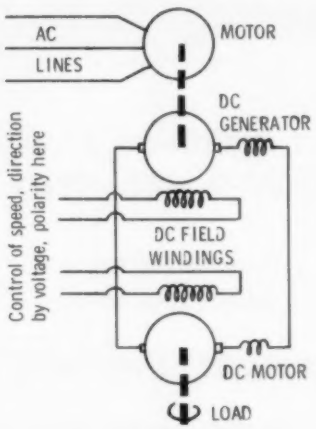
C. J. NEWELL, Design Engineer, General Electric Company

Use of direct current machinery is increasing. It has proven itself the answer to high productivity in many of the tough jobs common in industry. Control of speed and load-speed characteristics are, of course, the chief advantages. But new advantages are making themselves felt in today's DC equipment.

These special self-governing characteristics stem from a new breed of motor-generator set with built-in reflex actions.

Despite the many advances in means of supplying direct current, almost half of the total sales of DC equipment and M-G sets recorded by NEMA in the 1 to 200 hp bracket are now accounted for by M-G sets themselves.

When the job calls for fast starts, stops and reverses, the inherent "pump-back" braking of an M-G set can be put to good use. When, for example, load drops off, the M-G



set converts mechanical power (from momentum) back to electrical power and returns it to the generator. The generator then acts as a motor and puts a load on the AC line.

Control of speed and direction or rotation is achieved by varying magnitude and polarity of the DC field supply. And a whole line of DC motors can be controlled by the same generator.

In such cases "pump-back" is still effective. The motors and generators have interchangeable roles — when the line is stopped, generators become motors and put a load on the line. Instead of coasting to a stop, the line is given a high decelerating torque.

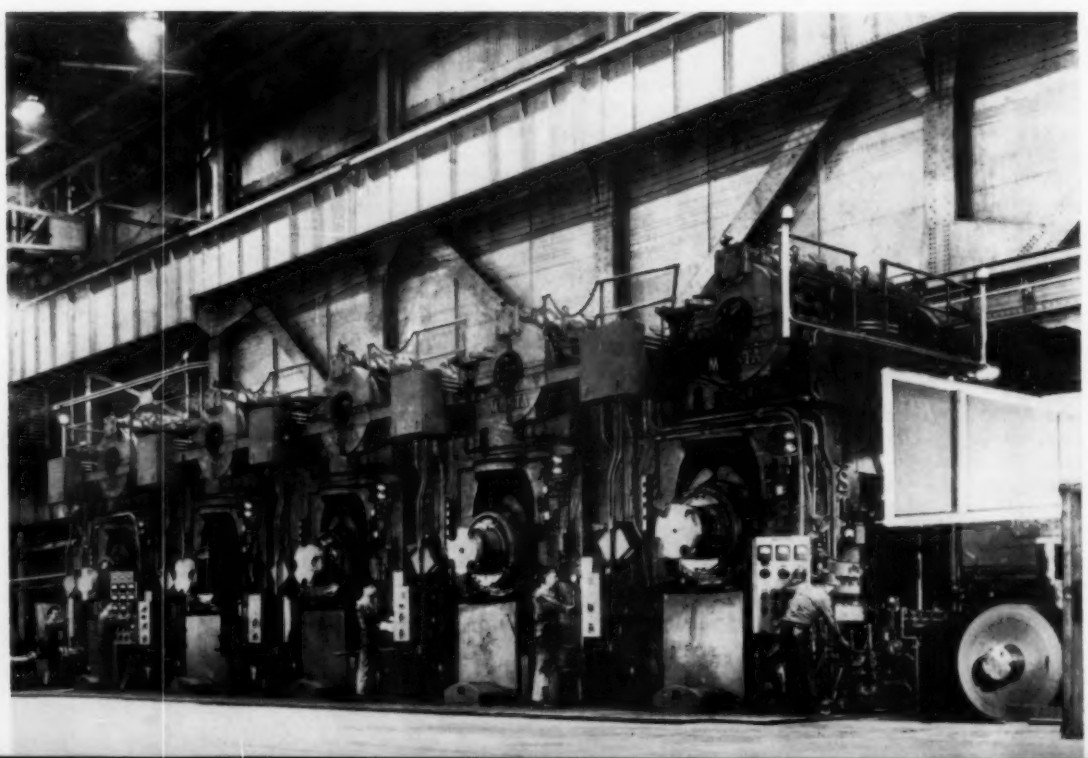
This ease of two-way transfer of power between motor and generator is the most important characteristic of the M-G set. It is the key to its ability to control speed and direction.

In several direct current motor applications, desired operation of the motor under load requires a direct current power source with special characteristics.

Voltage of the direct current power source may be required to change in a certain way as the load on the motor changes. In the machine tool industry, for instance, planers and broaches use DC motors which operate on a wide speed range.

During the cutting stroke such motors may be rotating rather slowly; on the return stroke the motor is accelerated to start the next stroke with as little delay as possible.

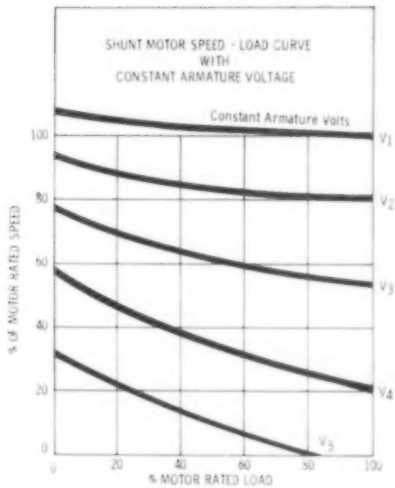
If a constant direct current voltage were applied during the cutting stroke, motor speed would decrease as the load increased. The motor could stall before completing the cut. What is needed is a



Several DC motors can be simultaneously controlled from the same generator. This is advantageous when sudden starts, stops, reverses are to be made

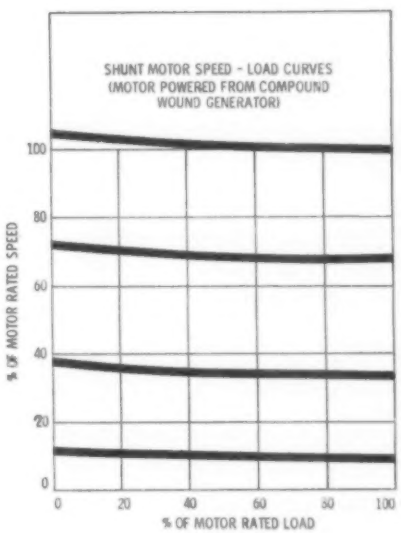
M-G SETS NOW IN USE:

- **apply dynamic braking inherently**
- **provide special characteristics like increasing motor speed as load increases**
- **produce dependable high power levels yet stall out any equipment in danger of overloading**
- **in short, they can be designed as power sources with reflex actions built in — a sort of rudimentary "brain"**



A.
Speed-load curves for a DC motor run from a constant voltage source. Note how rapidly speed drops with increasing load when motor is rotating slowly

B.
Speed-load curves for the same motor when power supply is a specially designed M-G set. At low speeds there is far less speed change with load



direct current generator whose output voltage will increase as the load on the motor is increased.

Addition of an extra winding on the generator accomplishes this requirement automatically. Speed curves (A) of a typical direct current motor whose power is obtained from a constant voltage source show that: At low speeds the motor regulation (change in motor speed from no load to full load) becomes excessive.

Another set of speed curves for the same motor (B) shows what happens when its power is obtained from a specially designed motor-generator set. Now when operating at low speeds the speed can be maintained as the load increases on the motor.

To obtain this special characteristic when the DC supply is other than a motor-generator set requires control equipment and a feedback system. With a motor-generator set the desired motor speed curve is built into the set and is automatic.

Overload protection

Shovel and cargo winch motors are generally powered by motor-generator sets because of the special volt-ampere curves required. Built-in characteristics are used to prevent the operator of the equipment from unknowingly overloading and damaging the motors and generators.

If the load on the motor exceeds a certain value, the generator voltage automatically drops to a low value and the motor stalls, warning the operator that the load is too great. (See C)

Industrial users of commercial AC are aware that short time peak loads of power cost money. Motor-generator sets can be applied to reduce some of these peak loads by taking advantage of the rotational inertia of the set itself. By coupling a flywheel to the motor-generator set, the AC power source can be protected from sudden shock loads.

The flywheel absorbs power and prevents transmitting these shocks to the power system. This type of flywheel motor-generator set is sometimes used on blooming mill drives in the steel industry where a hot ingot is passed back and forth between rolls by the reversing action of a direct current motor.

AC power costs can also be improved with the use of motor-generator sets by the addition of power factor correction when synchronous motors are used to drive the generators. Sometimes power factor regulators are used which give complete and automatic power factor correction regardless of the load.

On large motor-generator sets where thousands of kilowatts of power are being converted, this can amount to a big saving in power cost. Regulated power factor correction is not possible with other types of conversion.

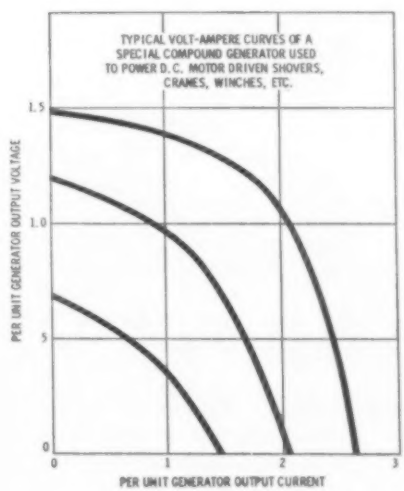
Simple maintenance

Many users of direct current motors specify motor-generator sets to simplify maintenance and replacement procedures. The motor-generator is similar to the motors being driven and a single maintenance method covers both equipments. Spare parts are similar and many can be used on both the generators and the direct current motors which they drive.

Motor-generator sets have other features which make them popular sources of direct current power. They are easy to control. A DC generator is, in effect, an amplifier of DC power. By controlling a relatively small amount of generator field power, a large amount of output power can be controlled.

To get even more amplifica-

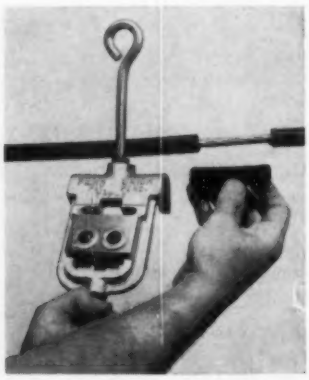
To page 34


TYPICAL VOLT-AMPERE CURVES OF A
SPECIAL COMPOUND GENERATOR USED
TO POWER D.C. MOTOR DRIVEN SHOVERS,
CRANES, WINCHES, ETC.
PER UNIT GENERATOR OUTPUT VOLTAGE
PER UNIT GENERATOR OUTPUT CURRENT

C.
Another special characteristic protects equipment from overloads. As loads pass permissible limit the motor is stalled

NEW DEVELOPMENTS

plant services — power services
maintenance



For easily removing hard-to-remove insulation from conductors, device is hooked over insulation, tightened up, and rotated to cut insulation away

Easily Strips Insulation from Conductors

A novel method of removing insulation from conductor can be accomplished with simple device that does not nick or scratch the conductor. For the first time, hard-to-remove insulations such as linear polyethylene can be quickly and easily stripped.

Called the "Penn-Peeler", the device is designed to remove a 2½" length of polyethylene, polyvinyl chloride, rubber or neoprene insulations from 3/64ths to 12/64ths wall on conductors ranging from #2 str to 4/0 ACSR.

One basic tool is used with individual, interchangeable cutter blades for each conductor and insulation combination.

All that is necessary to do is to hook the device over the insulation, tighten up by hand (or with a hot stick) until a stop is reached, and rotate around the conductor. The insulation piece falls away exposing bare conductor.

No nicks are possible because blade is correctly positioned by a built-in stop. Nothing is left to judgment.

("Penn-Peeler" is manufactured by Penn-Union Electric Corporation, Dept. PI, Erie, Pennsylvania.)
Circle 9271 opposite covers.

Highly accurate cell transmits pressure

Accurate to 0.5 of 1 per cent, absolute pressure transmitter is available in two pressure ranges. One covers 0-50 to 0-250 inches of water; the other, 0-200 to 0-850. Each is continuously adjustable within the limits given.

Output of the transmitter is a standard 3-15 psi linear signal proportional to the absolute pressure.

Basic element is a capsule using two diaphragms to sense pressure. Process pressure is introduced in the high pressure chamber. Other chamber is evacuated and sealed, acting as a reference. Process pressure is continuously compared with the absolute zero pressure.

Force generated by this pressure difference is applied to a force bar, a flapper-nozzle setup, a feedback bellows and a relay to produce the signal. Operation is a force balance.

There is no indicator at the cell. Designed with all parts exposed to process stream of 316 stainless, unit has overrange protection to 1500 psi and can operate at 250°F.

(Type 13AA d/p Transmitter is a product of The Foxboro Company, Dept. PI, Foxboro, Mass.)
Circle 9272 opposite covers.

Hydraulic slave unit built without frills

Designed to produce motion (a one-inch stroke) remotely, this hydraulic master-slave unit has a straight-line slave motion. It is less expensive than rotary types.

Body of the slave unit measures 2½ x 1 15/16 inches. Total piston length is 3⅞ inches. Thrust capacity of up to 1000 pounds makes it usable with governors, throttles, valves, clutches and similar devices.

Self contained, the all-hydraulic unit can be mounted in any position. Master and slave ends maintain synchronism at all times. But a filler-bleeder system contains equalizer valves for adjusting relative position of the two.

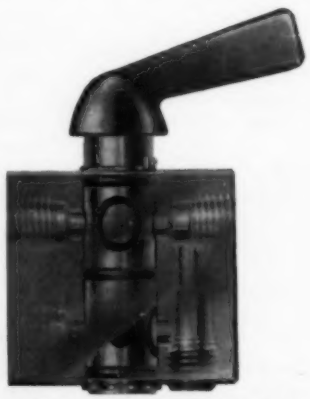
When temperature changes cause expansion or contraction of the hydraulic fluid, master unit makes an automatic compensation.

(Hydraulic slave unit is a development of The Hydronic Company, Dept. PI, 12685 Arnold Ave., Detroit 39, Michigan.)
Circle 9273 opposite covers.

Three-way plug valve has leakproof shutoff

Having a design which provides minimum of pressure drop, three-way plug valve handles both gases and liquids.

Using "O" rings on face of cylindrical plug and on diameter of plug produces easy operation and maintenance-free



Three-way valve uses "O" rings on face and diameter of plug

service without adjustment. Leakproof shutoff and prevention of external and body leakage are valuable assets to the valves' use on pneumatic and hydraulic equipment and plant air circuits.

Operating temperatures are −40 to 250°F. Operating pressures are to 150 psi.

(Series 9300 3-way plug valve is manufactured by Circle Seal Products Co., Dept. PI, 2181 E. Foothill Blvd., Pasadena, Calif.)
Circle 9274 opposite covers.

Details construction of fractional-hp motors

Eight pages of description and illustrations tell in detail the construction of line of all AC and DC fractional horsepower motors.

Available in three basic sizes, each model size is furnished in several lengths. Standard motor frames can be furnished with almost any type of winding.

(Bul 1021-B is issued by Bodine Electric Co., Dept. PI, 2500 W. Bradley Pl., Chicago 18, Illinois.)
Circle 9275 opposite covers.

Liquid level control is designed for many jobs

Designed for pump control or solenoid or motor-operated valves in tanks, sumps, or vessels, this top-mounted liquid level control comes in the flanged or screwed mounting.

These models are designed for wide "differential" applications — "differential" meaning the amount of liquid-level travel between the make or break on a single switch. With these applications in mind they are especially suited for pump control to either "fill" or "empty" tanks.

Specific gravity ranges, beginning at 0.5 depend on the type of displacer used in the operating temperature of the liquid. Displacers can be glazed porcelain (standard) or made up of a chemically inert impregnated-carbon. Stainless steel displacers are supplied on one particular model.

(Models A-102 and A-103 are manufactured by Magnetrol, Inc., Dept. PI, 2110 S. Marshall Blvd., Chicago 23, Illinois.)
Circle 9276 opposite covers.

14 boiler models rated 30 to 500 hp

Designed for hot water systems, line of 14 boilers will deliver heat continuously at varying demand or operate intermittently at a fixed rate. Standard pressure is 30 psi; maximum temperature, 250°F.

They may be specified for light oil, heavy oil, gas, or gas-oil firing.

Reverse water flow brings cold water into the top of boiler through a diffuser. This prevents overpressurization (boiler is on suction side of pump) and prevents air from getting to corrodable surfaces.

Entering cold water is squirted out through a diffuser tube which forces it to mix with hottest water near boiler's top. Air vent connection is also at top.

Installed in a by-pass, butterfly valves blend heated and returning hot water. Temperature control of the heated space drives these valves — thus temperature control is independent of boiler controls.

A limiting system (anti-shock control) senses water temperature at the top of the boiler. It keeps cold water additions within limits which promote long boiler life by stopping thermal shock.

All-welded, flanged piping is used in the design of all models in the line. Flanges are provided for field installation.

All units are factory equipped with low-water cut-off.

(SPW package hot water boilers are built by York-Shipley, Inc., Dept. PI, 500 Jessop St., York, Pa.)
Circle 9277 opposite covers.

Produces stable flame with 1000% excess air

Designed for sealed-in firing in industrial furnaces, kilns and other processing equipment, excess air gas burner produces stable flame with 1000 per cent or more of excess air.

Because of greater forward velocities of hot combustion gases, a better distribution, circulation and penetration of heat is effected.

Control of flame temperature is obtained with either large or small amounts of excess air.

Stratification of hot gases is minimized eliminating localized hot spots.

Ignition is positive at any burner setting on hot or cold furnaces, eliminating need for a continuous pilot. There is no burner flashback.

Burner nozzle and body are of heat-resisting alloy; tile is of super refractory. These are set in a box type mounting plate with a tile locking device holding the burner tile and plate in alignment.

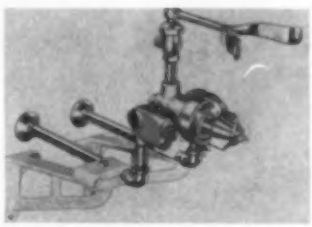
Entire assembly can be installed with air inlet at any one of four 90° quadrants.

(Excess-Air gas burner is manufactured by Hauck Mfg. Co., Dept. PI, 124-36 Tenth St., Brooklyn 15, N. Y.)
Circle 9278 opposite covers.

Knee-operated water mixer keeps worker's hands free

For industrial washing operations where the worker's hands aren't free to control the water, a knee-operated thermostatic mixing valve is practical.

Once the mixer has been turned to provide the desired



Knee-operated water mixer gives water of desired temperature to 110°F

water temperature to 110°F, the operator simply moves the volume lever with his knee to turn water on and off.

The unit has a 10-gpm capacity at 45 psi. It is accurate to within ±½°F and can provide water at any temperature between 65 and 110°F. A built-in shut-off stops water flow if temperature exceeds 110°F.

(Type H Hydroguard is manufactured by The Powers Regulator Co., Dept. PI, 3434 Oakton St., Skokie, Ill.)
Circle 9279 opposite covers.

What's the rap? these precipitators have full control

Control allows rapper adjustment for proper cleaning

The rapping procedure for cleaning plates in electrical precipitators depends largely on material being collected.

For example, materials with moderate electrical resistivity can be accumulated in relatively thick layers before the plates must be cleaned. Others have to be removed frequently.

Then too, some materials, because of physical or electrical characteristics, require intense rapping for proper cleaning. Too-intense rapping

To page 20

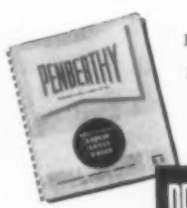
NEW!
PENBERTHY ILLUMINATORS
for Liquid Level Gages

58 WATT 3000 HOUR BULB
accurate readings

overall illumination
no glare
no blind spots

Faster, more accurate liquid level readings are provided by Penberthy's new, improved, explosion-proof, dust-tight illuminators. 58 Watt Bulb (with medium screw base) gives higher light intensity for 4-times the life of ordinary illuminators. Exclusive rugged aluminum housing over bulb extends bulb life, offers better protection and simplifies relamping. Clear plastic wedge diffuses light over entire length of gage glass.

Illuminators are easily installed on present or new gages. Available in single or double sections, they are used in combination for gages with 3 or more sections. Approved by Underwriters' Laboratories for Class 1, Group C and D hazardous locations.



For further information on Penberthy Illuminators, liquid level gages and valves, write or phone. Ask for Catalog #36.

PENBERTHY

PENBERTHY MANUFACTURING CO.
Division of Buffalo-Eclipse Corporation
1242 Holden Ave., Detroit 2, Michigan

Circle 9280 opposite covers.

A REPORT:

This is growth . . . healthy growth . . . and a credit to the power industry.

For the past half-century, the Duke Power Company has been serving the Piedmont Carolinas. Today this utility, covering a 20,000 square mile area, has 7 steam and 32 hydro-electric plants with a generating capacity of nearly 2¾ million kilowatts . . . 12 billion kilowatt hours a year. More than ½ million customers are being supplied with instant, dependable power for light, protection and comfort . . . reliable power for successful farming and progressive industry. And the Duke Power Company is expanding rapidly. New units are being constructed constantly. An investment of about $30,000,000. annually goes into this expansion program to service a fast growing area.

Every one of the present 39 power stations now operating this system was designed, constructed and developed by the Duke Power Company engineers. Each plant has been kept modern in every respect. And every one of these stations uses Chapman Valves. Chapman Valves have been used by this system since the turn of the Twentieth Century. They have been used for many sound and practical reasons.

Chapman steel valve . . . 16" x 14" x 16" . . . pressure seal type, 1500 lb. series. Chapman is constantly supplying growing industries with valves for increasingly high pressure and temperature service.

on the Duke Power Company and Chapman Valves

Above: Cliffside units 1, 2, 3, 4. Total kilowatt capacity 220,000.
Below: Buck units 1, 2, 3, 4, 5, 6. 460,000 kilowatt capacity.

Above: Riverbend units 1-7 with a total capacity of 665,000 kilowatts.
Below: Dan River units 1, 2 and 3. 300,000 kilowatts total capacity.

Above: Allen Steam Plant — Two additional units no v under construction.
Below: Lee units 1 and 2. 385,000 kilowatts. Unit 3 opens December 1958.

The CHAPMAN VALVE

Manufacturing Company INDIAN ORCHARD, MASSACHUSETTS

Study the record of The Chapman Valve Manufacturing Company for the past 75 years and you'll find the many reasons why Chapman Valves are used by Duke Power and many other important Companies in many fields of endeavor. Chapman designs, develops, produces and delivers valves — that meet the requirements of today and of tomorrow. A consultation between Chapman engineers and yours, with no obligation to you, is sincerely recommended. Simply write . . . today, anytime, soon.

Circle 9281 opposite covers.

From page 17
may cause others to be re-entrained in the gas stream.

Manufacturer of precipitation equipment has announced development of a full-range rapper control which permits ready adjustment of rapping frequency, intensity, and pattern to assure proper cleaning.

By adjusting a dial, the full-range unit can be adjusted to give a cycle as fast as a complete rapping every 50 seconds — or as slow as one every 3½ hours — or at any interval between these limits.

Also, degree of rapper impact is continuously adjustable from zero to maximum. And number of impacts per cycle (2, 4, or 8) can be selected.

When a variable cycle is chosen, the first blow is soft to remove only heaviest accumulation. Each successive one is stronger until maximum pre-set impact is reached. This pattern repeats on succeeding cycles.

(More information on full-range rapper control can be obtained from Western Precipitation Corporation, Dept. PI, 1000 W. Ninth St., Los Angeles 54, Calif.)
Circle 9282 opposite covers.

Lubricates and protects wire rope, cable — in aerosol can

Packaged in a 16-oz push-button, aerosol container, spray lubricant provides users a handy, quick, easy method of applying lubricant to wire rope and cable.

Protection is offered by lubricant with its ability to penetrate to the rope core, minimizing internal friction and eliminating corrosion of rope and cable.

Its "non-gumming" qualities will reduce "carry-back" of abrasive dirt and dust.

The company is making available a free 16-oz trial sample can.

(Aerosol Wire Rope Spray Lubricant is manufactured by The Whitmore Mfg. Co., Dept. PI, 3816 Iron Court, Cleveland 4, Ohio.)
Circle 9283 opposite covers.

Watches 24 temp points, signals any trouble

Bearings or other components whose temperature is critical can be "watched" with a 24-point scanner. It will also check pressures or other variables which will produce an electrical signal.

Using a single meter-relay, scanner examines one point at a time. Every five seconds one thermocouple's output is compared to high and low limits set on the relay. If out of bounds, it causes warning light to flash. It can also set off an alarm — or even shut down equipment.

Only one meter-relay is used in 24-point scanner

When the alarm goes off, operator need only glance at numerical indicator tube on instrument's front panel to see which station is in trouble.

One condition is imposed by using the economical design with only one meter-relay: Only one high and one low alarm point can be used for all points.

Fail-safe features keep the control circuit broken after an alarm until source of the trouble is found and corrected. Manual reset button then puts scanner back in operation. Reset is also needed after loss of power.

(Scanning control is built by Assembly Products, Inc., Dept. PI, Chesterland, Ohio.)
Circle 9284 opposite covers.

Bolted bonnet, gland fits globe valve for 800 psi

Built for socket weld or screw end connection in ¼ to 2" sizes, general purpose globe valve is rated for 150 to 800 psi service. Both bonnet and gland are bolted.

Forged steel bodies have integral seats of Stellite or equal material.

While other trims are available, standard disc is 13 per cent chrome stainless. This provides good resistance to wear and erosion. Yoke nuts are of high melting point alloy.

Forged steel packing glands hold packing in extra deep stuffing boxes. Glands are single pieces. Studs and nuts are stainless.

Spiral wound, the stainless gaskets are asbestos filled. They are designed for high temperature, high pressure service. Precision machining achieves drop-tight operation.

(General purpose globe valve is a product of Henry Vogt Machine Co., Dept. PI, 10th and Ormsby St., Louisville 10, Kentucky.)
Circle 9285 opposite covers.

Pulls up joints

. . . in pipe from 6 to 16" diam. Six sizes of this coupler handle corresponding sizes of cement-asbestos, concrete, clay or cast iron pipe.

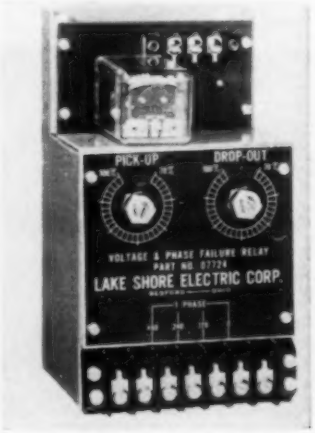
Doing the whole job of pulling up pressure joints with a single lever action, it is fast enough to allow the pipe-laying crew to keep up with ditching machines.

(Pipe Coupler is a product of E. H. Wachs Company, 1527 N. Dayton St., Chicago 22, Ill.)
Circle 9286 opposite last page.

Differential voltage sensing relay uses printed circuit

For installations where varying voltage factors are undesirable, a differential voltage sensing relay will protect, in addition to power and lighting systems, industrial motors, machine tools, and process equipment.

In electronic applications, it may be employed to protect radar gear and microwave relay systems.



Device protects against varying voltages

Providing a control range of 70 to 100 per cent of rated voltage for both drop-out and pick-up with a minimum one-volt differential, the differential relay employs a simple printed circuit with a standard plug-in SPDT relay to open and close circuits.

A Zener diode and transistors employed in the sensing circuit assure high sensitivity. The plug-in relay affords positive, consistent response without chatter.

The relay is designed for DC service of both 6 to 49 volts, and 50 to 250 volts. The AC service range includes both single and three phase, 3 wire and 4 wire.

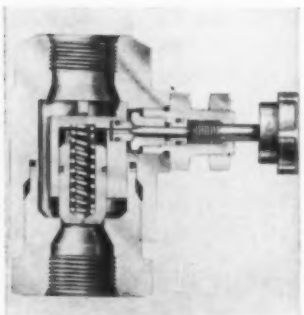
Standard AC relays are available in open models or with NEMA Type-2 closures.

(Differential voltage sensing relay is manufactured by Lake Shore Electric Corp., Dept. PI, Bedford, Ohio.)
Circle 9287 opposite covers.

Controls 5000-psi oil line with only 10 lb torque

Hydraulic lines with pressures up to 5000 psi can be controlled by this on-off valve. It requires only ten pounds of torque at the stem to complete its single-turn control action.

For use wherever hydraulic fluid cannot reverse its direction of flow, valve is seated by back-pressure. Actuating the pilot kills this back-pressure to quickly open main valve. Almost unrestricted straight-through flow results.



Pilot control valve for manual, pneumatic or solenoid actuation on hydraulic lines

Direct acting solenoid or 50-150 psi pneumatic operators are interchangeable on the body. Size range is ½ to 2″ with either O-ring sealed or pipe thread connections. Body is aluminum alloy; working parts, stainless.

(Ez-O-Trol valve is a product of Republic Manufacturing Company, Dept. PI, 15655 Brookpark Rd., Cleveland 35, Ohio.)
Circle 9288 opposite covers.

Oil and water don't mix in this oil heater

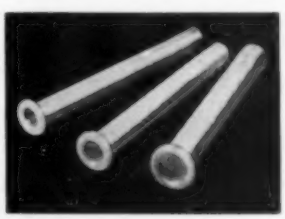
One problem in preheating No. 6 fuel oil in high temperature hot water systems is the danger of oil leaking into the hot water stream. In place of conventional schemes like steam evaporators or water-to-water isolating heat exchangers, this heater uses a barrier.

Heater raises oil to an adequate temperature, isolates the oil and hot water circuits, is simple to operate, takes less space and has a lower first cost than conventional methods.

It uses a number of double tube elements. These — with one tube inside another — are enclosed in the heater shell. Oil flows through the shell. Hot water flows in the opposite direction through the inner tube. In the space between the tubes a thin film of heat exchange fluid carries the heat.

Should there be an oil tube failure, oil cannot contaminate the boiler water. As oil enters the heat transfer liquid section, it rises into an expansion chamber sight glass, providing a visible warning to personnel.

(Paracoil Thermo-Film oil heater is a product of Davis Engineering Corporation, Dept. PI, 1064 East Grand St., Elizabeth 4, N.J.)
Circle 9289 opposite covers.



Nylon protectors . . .

. . . for condenser tubes are so designed to prevent turbulence. This is accomplished by having inner wall tapered gradually toward discharge end, providing thinnest possible wall at that point. The nylon offers high resistance to sand blasting, air impingement, corrosion, fungus, alkalis and solvents.

Units are available in the following sizes: ¾ inch 16 and 18 BWG; ⅞ inch 17 and 18 BWG; and 1 inch 18 BWG. Other sizes will soon be available.

(Nylon-tube protectors are manufactured by Crane Packing Co., Dept. PI, 6400 Oakton St., Morton Grove, Ill.)
Check 9290 on Reader Service Card.

Easy maintenance featured in DC brake

Using a nut-cracker design, brake for DC motors is sized for 10, 14, 16, 19, and 23-inch wheels. It meets NEMA-AISE standards for NEMA 600 series mill motors and equivalent units.

Hinged at the top, "nut-cracker" design distributes power equally to the shoes. These are held in spring-loaded sockets without depending on pins to connect them to the arms. With a partial turn of a wrench, shoes can be slid out to the side without removing the wheel.

All maintenance adjustments can be made from the top of the brake. Single adjustment sets the air gap — as shown by built-in indicator. Magnet case and coil can be replaced without releasing the brake. And brake wheel and motor armature can be removed without disturbing torque setting.

Any adjustment of this brake can be made from the top

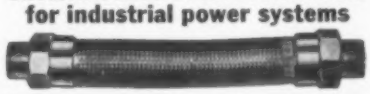
All adjustments can be made from the top of the brake. Screwdriver and adjustable wrench are the only tools needed.

(Bul 106 DC Brake is a product of Clark Controller Company, Dept. PI, Cleveland 10, Ohio.)
Circle 9291 opposite covers.

For more information on items reported in the New Developments section circle corresponding numbers on reader service card opposite covers.

COBRA® FLEXIBLE
SEAMLESS METAL HOSE

Custom constructed assemblies for industrial power systems



All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

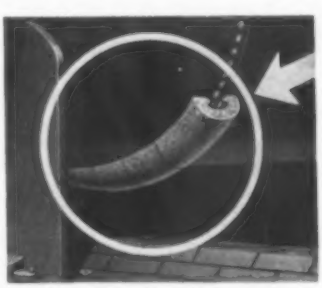
write — wire — phone: RE 7-3311
...for prices and catalogs

COBRA METAL HOSE
5059 S. Kedzie Ave. • Chicago 32, Ill.
Circle 9292 opposite covers.

YOUR LUCK MAY RUN OUT

If the girth seam of your riveted HRT boiler has never buckled and leaked, you are fortunate. From the very nature of the case, your luck is likely to run out.

No one can predict when the seam will open up unless it is insulated with a National Seam Protector. *The way to prevent is to protect.*



We'll be glad to give you complete information by mail. No salesman will call.

National Boiler Protector Co.
938 Reibold Bldg., Dayton 2, Ohio
Since 1916

Circle 9293 opposite covers.

Records temperatures throughout tunnel kiln

Thermocouples travel with work

Giving a continuous record of actual working temperatures, this traveling tunnel-kiln pyrometer is designed to record temperatures to which work passing through a kiln is subjected during entire run.

This permits accurate adjustment to kiln controls based on actual working temperatures.

Swaged thermocouples of specified length are mounted on a test car in the required locations. The thermocouples are connected to a potentiometer by a long armored extension cable containing a pair of extension wires for each thermocouple.

The cable is fed from the recorder into the kiln and is drawn through the kiln with the test car.

(Traveling Kiln Pyrometer is manufactured by The Bristol Co., Dept. PI, Waterbury 20, Connecticut.)
Circle 9294 opposite covers.

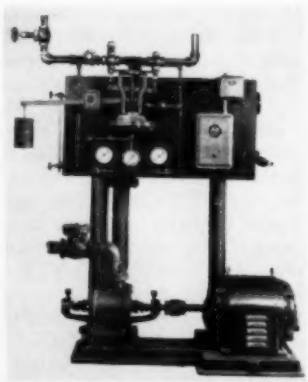
Boiler return system automatically maintains pressure differential

Containing a patented differential valve, boiler return system automatically maintains any desired differential in pressure between steam in the boiler and pressures in the system's receiver tank.

Since the system requires only 25 psi pressure differential, power required for pumping is reduced 75 percent. Features include a two-stage pump to replace dual pump arrangement formerly used, floatless liquid level control, chrome-plated pump internals, and Teflon packing in differential valve.

It is reported that the system will return condensate from steam processing units to boiler at 300 degrees or higher — 15 to 20 degrees less than the operating temperature. System also reduces raw make-up water needs by up to 90 percent.

(Boiler return system is manufactured by Stickle Steam Specialties Co., Dept. PI, 2215 Valley Ave., Indianapolis 18, Ind.)
Circle 9295 opposite covers.



Boiler return system has patented differential valve which maintains any desired pressure differential

One adapter . . .

. . . several wrenches

. . . will increase range of torque wrench applications. Series of drive end accessories (box wrench, ratchet, drive square in bottom photo) fit basic adapter arm. One normal size torque wrench (top photo) adds to adapter arm.

(Torque wrench adapter is manufactured by P. A. Sturtevant Co., Dept. PI, Elmhurst, Ill.) Check 9296 on Reader Service Card.

Filters, warms outside air for uniform ventilation and temperature

Designed to temper and filter outside air entering ventilated areas, gas-fired units operate on natural, mixed, manufactured and propane gas.

By supplying sufficient volumes of clean, pre-heated air to replace exhausted air, negative pressures with resulting infiltration of cold air are eliminated. Result is better pressure balance with more uniform temperatures in all factory areas.

Gas-fired unit supplies clean, warm air to replace exhausted air in all factory areas

As unit is a self-contained package, only fuel and electrical connections are needed to be made to place it in operation.

Four sizes from 36 to 54" for various capacities, Btu ratings, and pressure conditions are available.

Direct-fired burner and premixer assembly maintains correct air-fuel ratios at all firing rates and gives quick response to changes in air inlet temperatures.

Fan, burner and shutter assembly are operated automatically, with safety switches to prevent premature firing and accumulations of combustible fumes and gases.

Safe, odorless combustion is assured with any commercially available gas fuel. Temperature and pressure-sensing controls provide full protection against overheating and flame failure.

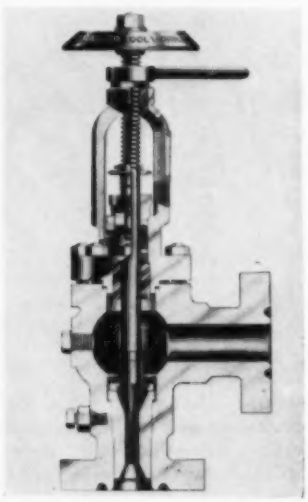
(Gas-fired industrial make-up air units are manufactured by Aerovent Fan Co., Inc., Dept. PI, 740 E. Ash St., Piqua 37, Ohio.)

Circle 9297 opposite covers.

Throttles flow at 10,000 psi

Designed for service with liquids or gases, this high pressure valve throttles flows at line pressures to 10,000 psi. Lower pressure ratings are also available and all ratings can be furnished in sizes from 1 to 6" diameters.

Excellent flow characteristics of the valve are a result of the double taper throat. A pointer and calibration plate on the yoke indicate valve opening. And interchangeable valve tips produce desired control. These tips include:



Precision valve is built in 1 to 6" sizes

- conical tip (shown)
- micro tip — equal change in orifice area with equal stem travel
- thermo tip — internal heating element in the tip
- extra-hard metal tips for abrasion problems.

Pneumatic and hydraulic valve operators are available to match all sizes.

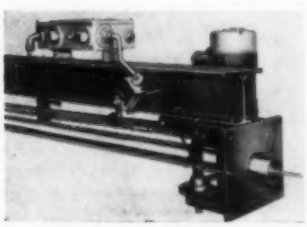
Built with ASA or API flanged or threaded connections, valves are made of carbon steel, stainless, bronze or aluminum.

(Metering valve is a product of Shaffer Tool Works, Dept. PI, 209 S. Pomona Ave., Brea, Calif.)
Circle 9298 opposite covers.

Finds boiler's hot spots, transient conditions during start-up

It is now possible to record temperatures and find hot spots during boiler start-up. Traveling temperature probe will also record transient temperatures within its reach.

Like a soot blower, the sensing device travels back and forth through critical superheater or other furnace passes to show instantaneous temperatures. At all times it also indicates its own position.



Traversing mechanism probe

Probe itself is a chromel-alumel thermocouple. Except for the fact that it does not rotate, its motion is just like that of a lance. The couple will measure temperatures to 2200°F. Above 1000°F air cooling is supplied; above 1600°F probe carries a protective tip.

Cooling air — 250 cfm at 100 psi — introduced into traveling carriage — flows to cool probe without affecting temperature readings.

Automatically traversing at six feet per minute, probe can be stopped at any point for repeated checks. It steadies to final reading within one second. Temperatures it reports are within ten degrees of those shown by fixed thermocouples in the same location.

Complete setup is available in lengths to 30 feet. It includes electric drive motor, alloy lance, furnace wall sleeve, air hose reel, thermocouple and lead wire, and controls. Recorder, alarms, position indicators can be supplied to specification.

(Temperature Probe is a development of Copes-Vulcan Div., Blaw-Knox Company, Dept. PI, Erie 4, Pa.)

Circle 9299 opposite covers.

Hydraulic power unit is air cooled

Fans are interlocked to run when motor runs pumps

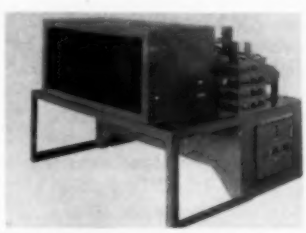
For use on jobs where water is at a premium and refrigeration is too costly to maintain reasonable temperatures, this hydraulic power unit is provided with air cooling.

Cooling is provided by fan which draws air to cool fluid in reservoir and maintain that temperature.

Fans are interlocked to run whenever the electric motor runs the hydraulic pumps. Given a hydraulic heat load or efficiency, the reservoir is maintained at a fixed temperature differential above the ambient conditions.

Thermostatic controls may be added to maintain a more consistent temperature if desired.

Unit consists of two small double-vane pumps that are coupled to a double-end shaft, 7½-hp electric motor with flexible couplings. Separate pressure controls are provided for the four pumps.



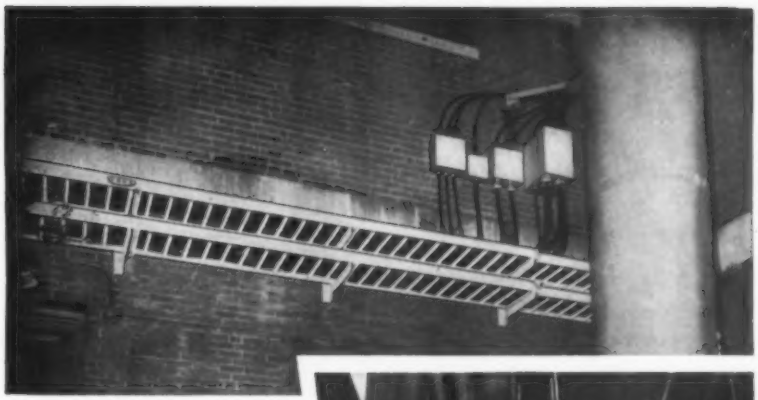
Hydraulic power unit is designed for jobs where water is at a premium and refrigeration is too costly

Two 11-gpm pumps are used for servo-controlled tracers and the other 11-gpm and three-gpm pumps are for related functions such as clamp and positioning cylinders.

Connections are brought to one corner of the unit to simplify attachment to a machine.

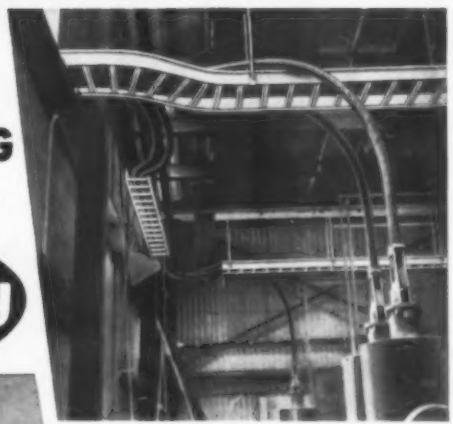
(Air-Cooled Hydraulic Power Unit is manufactured by Hydraulic-Division, J. N. Fauver Co., Inc., Dept. PI, 51 W. Hancock Ave., Detroit, Michigan.)

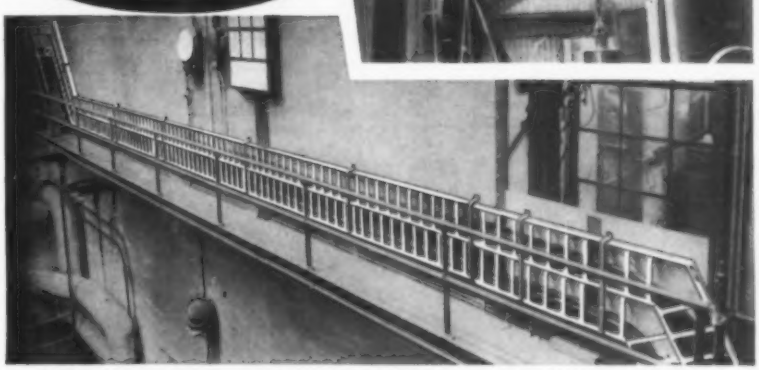
Circle 9300 opposite covers.



a new, superior system of CABLE and TUBING RACE WAYS...

Globetray PAT. PENDING





A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point—insides and bottom always smooth—all sections punched for easy installation—perfect fit at all times. Neat, clean and uniform in appearance.

Globetray THE GLOBE COMPANY

EASY TO INSTALL • SAVES TIME • SAVES ON MATERIAL
GALVANIZED • NO MAINTENANCE PROBLEM

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Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classified telephone directory.

PRODUCTS DIVISION The GLOBE Company

4036 S. PRINCETON AVE. • CHICAGO 9, ILL.

Circle 9301 opposite covers.

NEW LITERATURE

plant services — power services maintenance

Reviews of books and industrial bulletins describing equipment, supplies, services

Shows control system for automatic burners

Pre-wired and pre-tested panel control systems for automatic oil and gas burners are shown in four-page bulletin.

Included in the bulletin is a handy chart for specifying.

Illustrations of installations show how the systems having a compact, integrated design can be located almost anywhere in relation to boiler and burner.

(AIA File No. 30-G-6 is issued by Iron Fireman Mfg. Co., Dept. PI, Cleveland, Ohio.)
Circle 9302 opposite covers.

Discusses seawater distillation

Six-page illustrated bulletin describes operating principle of thermocompression distilling equipment for producing fresh water from salt.

Equipment is available in form of complete, self-contained, packaged units.

(Seawater Distillation bul is available from Mechanical Equipment Company, Inc., 861 Carondelet St., New Orleans 12, La.)
Circle 9303 opposite covers.

Emergency roof repair

A kit for handling emergency roof repairs is described in one-page product data sheet.

The sheet discusses kit uses and contents and has an illustration that demonstrates roof repair under wet, rainy conditions.

(Form 1107 is issued by The Monroe Co., Dept. PI, 10703 Quebec Ave., Cleveland 6, O.)
Circle 9304 opposite covers.

Easy way to select valves, level gages

Slide-rule selector offers an easy method for selecting correct size and type of liquid level gages and valves for any job.

Pocket-sized selector gives size numbers, visible glass and center-to-center connections for complete line of gages in all types and pressure groups.

Other data includes individual pressure-temperature graphs on each type of gage, and illustrations of various gage-valve combinations, and cross-sectioned illustrations and data on various types of valves.

(Slide selector is available from Jerguson Gage & Valve Co., Dept. PI, 80 Adams St., Burlington, Mass.)
Circle 9305 opposite covers.

Measures flow rate in large pipes

Line of rotameters for measuring fluid rate of flow in pipe lines two inches in diameter and larger, is presented in four-page bulletin.

The meters are applicable to both liquids and gases.

A complete installation is described as comprising an orifice in the main pipeline, and a smaller bypass line across the orifice containing a small orifice and a rotameter of the indicating, alarm, or transmitting type.

There are easy-to-follow instructions and graphs for determining permanent pressure loss across the main orifice and required straight run of pipe before and after the main orifice.

(Bul 18B is issued by Schutte and Koerting Co., Dept. PI, Cornwells Heights, Bucks County, Pa.)
Circle 9306 opposite covers.

Describes safety bung

Safety bung designed to protect against explosion of volatile liquids in drums and storage is subject of two-page bulletin. Pop-off plug in bung releases at 15 psig or 160° F.

Included are application information, cutaway drawings and complete engineering information.

(Bul F-17 is available from Jordan Industrial Sales Div., of OPW Corporation, Dept. PI, 6013 Wiehe Rd., Cincinnati 13, Ohio.)
Circle 9307 opposite covers.

Portrays high voltage air-break contactor

Besides portraying design features of high voltage air-break contactor, six-page, fold-out bulletin carries a table of ratings and dimensions.

The contactors, designed for switching applications to 5000 v, have short arcing time for plugging and dynamic braking operations.

(Bul 14B7303B is issued by Allis-Chalmers Manufacturing Co., Dept. PI, Milwaukee 1, Wis.)
Circle 9308 opposite covers.

Discusses heater replacement

Four-page bulletin, entitled "Repair or Replace?" discusses the economies of steam and hot water unit heater replacement.

Subjects covered include: why unit heaters fail, leaks signal failure, relative costs of replacing or repairing, and benefits of replacement program.

(Bul 158-B is available from Modine Manufacturing Company, Racine, Wisconsin.)
Circle 9309 opposite covers.

Removes hydrocarbons from air, gas

Bulletin of 10 pages describes how hydrocarbon vapor absorption units provide clean, dry air and gas for a multitude of uses.

The 14 standard sizes available are explained in detail to tell how the device protects systems and pneumatically operating instruments and mechanisms from effects of oil vapor, free oil, water-oil emulsions and dirt.

(Bul SC-1047 is available from Selas Corporation of America, Dept. PI, Dresher, Pennsylvania.)
Circle 9310 opposite covers.

Describes portable generator set

Design highlights, engineering and construction features of portable, lightweight generator set are covered in a six-page fold-out bulletin.

Included are sketches showing in-use application of the unit, cutaways, and photographs of numerous components.

Specifications are given.

(Cat BU-412 is issued by Allis-Chalmers Mfg. Co., Engine Material Handling Div., Dept. PI, Milwaukee, Wis.)
Circle 9311 opposite covers.

Lubrication alarm system is subject of bulletin

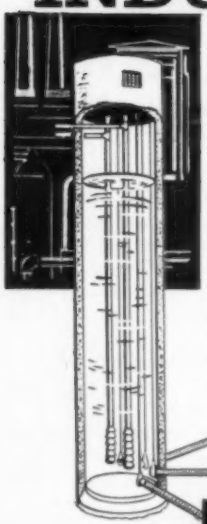
Protective device for use on force-feed lubricating systems is described in two-page bulletin.

Unit is installed at each terminal point of lubrication by simply cutting the line and connecting the fittings. It is then connected electrically to any desired audio, visual or mechanical warning device.

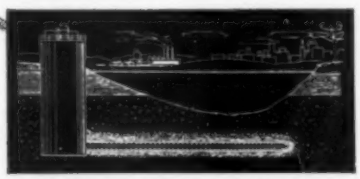
If flow of lubricant through unit is interrupted for any reason, the signalling system is activated.

(Form LLA 858 on the "Lube-Line Alert" is available from Manzel, Dept. PI, 315 Babcock St., Buffalo 10, New York.)
Circle 9312 opposite covers.

INDUSTRIAL water... a job for the RANNEY METHOD



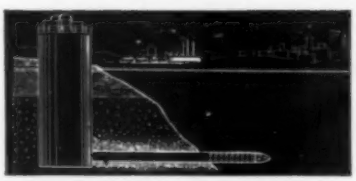
Conventional Collector. Proven by industries the world over, the collector that yields more naturally filtered water, with less equipment, less personnel, and fewer pumps than any other conventional collector.



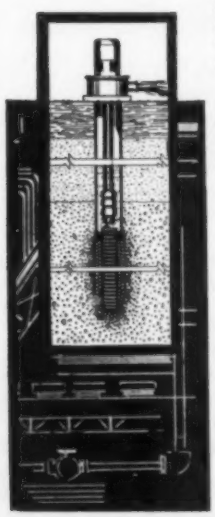
Infiltration Gallery. The gallery, engineered by Ranney, provides industry a low cost water supply. The gallery provides large quantities of clear non-turbid water in a revolutionary yet economical way, and it requires no maintenance.

A Few Industries Now Using the Ranney Method

Granite City Steel Co.
U. S. Steel Corp.
Wheeling Steel Corp.
Shell Oil Co.
The Texas Co.
American Cyanamid Co.
Eli Lilly and Co.
Allied Chemical & Dye Corp.
Monsanto Chemical Co.
Mead Corp.
MacMillan & Bloedel Ltd.
E.I. DuPont de Nemours & Co.
Olin Mathieson Chemical Corp.
Timken Roller Bearing Co.



Ranney Intake. The Ranney Intake, already has proven that plants and factories can obtain surface water both efficiently and economically. The Ranney Intake can usually fit into the design of your engineering department or consultant.



Ranney Vertube. Small industry and low volume users can now have a natural gravel vertical water well at low cost. Engineered with the same Ranney precision that has made their method a *must* for industry.

RANNEY METHOD

Dept. PI

Ranney Method Water Supplies, Inc.
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Ranney Method International, Inc.

Circle 9313 opposite covers.

CUT HERE AND FILE

POWER PLANT & POWER SERVICES INDUSTRY

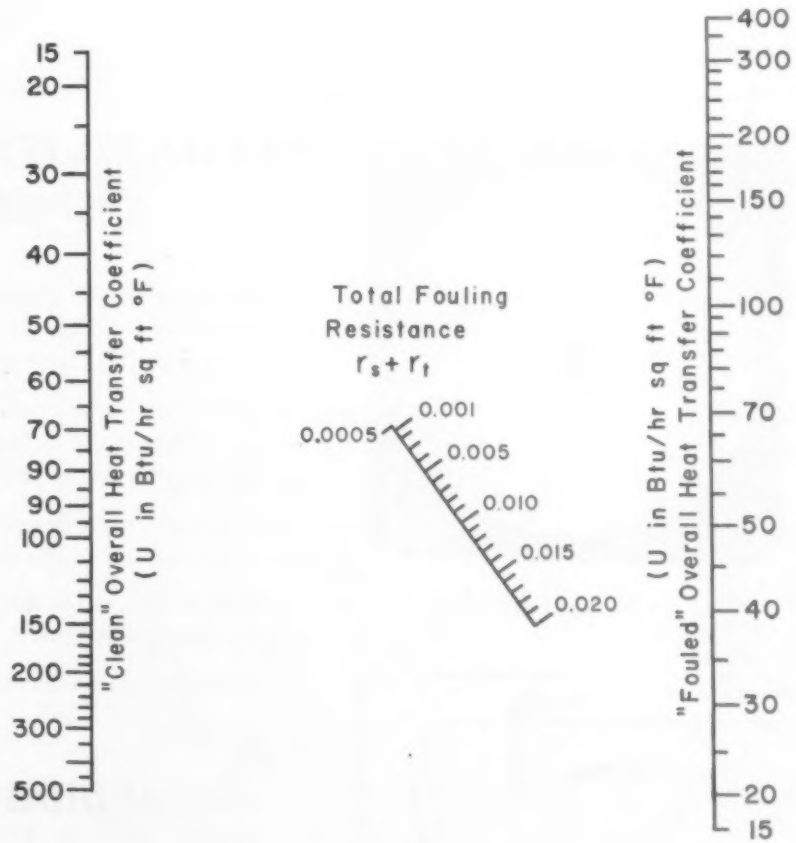
Correcting Heat Transfer Coefficients for Degree of Fouling

Data from THE LUMMUS COMPANY'S "Standard Heat Exchangers"
Nomograph by BRUCE FADER

Overall heat transfer coefficients are normally given for clean, new tube. While corrections can be made for the effect of fouling resistances, they are tedious to make.

Among data presented in "Standard Heat Exchangers" are a family of curves which show effect of fouling. They have been reduced to a nomograph which conveniently relates actual or "fouled" overall heat transfer coefficients to the "clean" coefficient and the degree of fouling.

Total fouling resistance, a function of type of fluids being used, can be determined from handbook values.



Courtesy of Chemical Processing

Describes three types of reciprocating pumps

Catalog covers 42 standard sizes of reciprocating pumps with tabulated pressure horsepower data. Complete specifications are given, and illustrations include sectional views and close-ups of important details.

Pumps are offered for capacities ranging from 2 cc per hour to 675 gph. Pressures range to 4575 psig.

(Cat 758 is issued by Jaeco Pump Co., Dept. PI, Villanova, Pa.)
Circle 9314 opposite covers.

Heavy duty M-G set described in full

Unit to provide DC variable speed drive from an AC network is shown in four-page bulletin.

A basic schematic illustrates principle of this heavy duty motor-generator set which is completely assembled and wired in a space-saving metal cabinet.

(Bul SB-183 is issued by Marathon Electric Mfg. Corp., Dept. PI, Wausau, Wis.)
Circle 9315 opposite covers.

Tells of hydrogen zeolite water softeners

Eight-page bulletin discusses hydrogen zeolite process, its chemistry, and variations in methods for neutralizing mineral acidity of hydrogen zeolite effluent.

Types of zeolites are discussed as well as relative advantages and disadvantages of various regenerants.

A brief description of decarbonators is included.

(Bul 4530-A is issued by Cochrane Corp., Dept. PI, Philadelphia 32, Pa.)

Deaerating heater

Six-page bulletin filled with specifications, diagrams, describes deaerating heater.

Complete information on the two-stage spray-type packaged heater is given.

Units come complete with internal vent condenser of stainless steel, and all controls and valves in capacities ranging from 2800 lbs/hr to 100,000 lbs/hr.

(Bul WC-118A is issued by Graver Water Conditioning Co., Dept. PI, 216 W. 14th St., New York 11, N. Y.)
Circle 9316 opposite covers.

For more information on items reported in the New Literature section circle corresponding numbers on reader service card opposite inside covers.

Pictorially presents storage rack uses

Over 20 photographs taken in plants where line of adjustable storage racks are in use show a wide range of application.

The six-page fold-out bulletin shows the storage of aluminum, brass, steel, and copper, diesel oil and engine parts, firebrick, pump valves, electrical parts, oil and pipe line equipment, and building materials.

Racks are custom-built for any storage requirement and can be used in single, double, or multiple sections. They can be galvanized for outside use.

(Adjustable storage racks bul is issued by Palmer-Shile Co., Dept. PI, 15979 Fullerton, Detroit 27, Mich.)
Circle 9317 opposite covers.

How to handle coal

The increased importance of coal handling equipment is discussed in illustrated detail in 16-page booklet.

Methods described include barge and railroad car unloading facilities, storage and reclaim, conveying and elevating, crushing, weighing, sampling, distribution to bunkers and dust control.

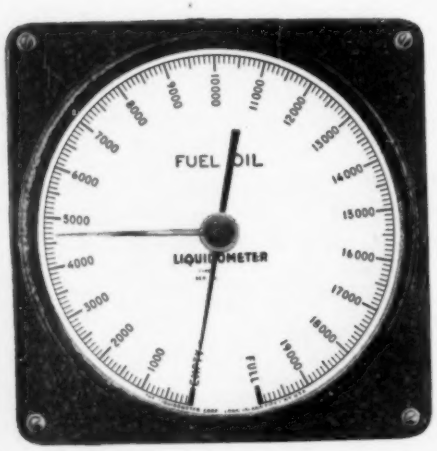
(Booklet No. A-2029 is issued by Link-Belt Co., Dept. PI, Prudential Plaza, Chicago 1, Ill.)
Circle 9318 opposite covers.

Centrifugal pump data

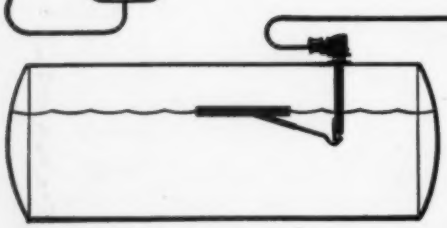
Among data presented in this 16-page bulletin, there are charts and tables correlating heads and rates, complete specifications, and materials of construction parts list of line of single stage, double section centrifugal pumps.

The pumps with horizontally split cases are available with either grease-lubricated or oil-lubricated bearings.

(Bul 721.6 is available from Goulds Pumps, Inc., 47 Black Brook Road, Dept. PI, Seneca Falls, New York.)
Circle 9319 opposite covers.



Senior
Case Size 12" Square



READABILITY DEPENDABILITY

Liquidometer Remote Reading tank contents gauges are self-contained and operate entirely automatically not requiring any outside source of power.

Liquidometers may be used on all grades of fuel oil from the lightest to #6 or Bunker C, Diesel Oil, Gasoline, Kerosene, Alcohol or practically any other liquid.

For residential tanks or small industrial plants several sizes of Levelometer gauges are available.

All Models approved by BSA, N. Y. Underwriters Laboratories and Factory Mutual.

Complete information furnished upon request.

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Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

Circle 9351 opposite covers.

IMPROVE YOUR SAFETY RECORD

We can help you!

Type "A" siren

One simple warning signal can eliminate a hazard. The first lost-time accident prevented pays for it. One general alarm siren or one Beacon Ray light pinpointing a danger spot involves no expensive practice or training program. Whether it's a confined operational hazard or a possible general catastrophe, FEDERAL Sirens, Horns, Bells or Lights will give that few seconds advance warning that can be the difference between life and death.

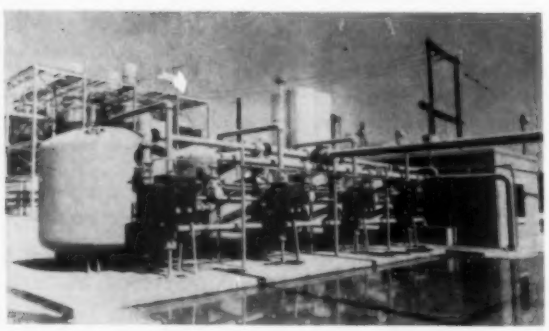
Survey your operations again, select your needs from the FEDERAL Catalog #100 for better safety record!

#271 Beacon Ray

FEDERAL SIGN and SIGNAL Corporation

8709 S. State St., Chicago 19, Ill.

Circle 9320 opposite covers.



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(for over half a century)

Complete plants for water softening, demineralization, silica removal, de-oiling of condensate, clarification, de-alkalizing and all other requirements.

Send for Bulletin BFT-11
or Nearest Field Representative.

HUNGERFORD & TERRY, INC.

CLAYTON 1, NEW JERSEY

Circle 9321 opposite covers.

CUT HERE AND FILE

Thermal Conductance of Tubing

J. BRONSON BAYLISS
Asheville, N.C.

In designing heat exchangers, many engineers consider thermal resistance of the tubing to be negligible in comparison with film resistances. Actually, for heavy-wall tubing and low-conductivity metals such as stainless steel, the resistance of the tube-wall is often important.

This nomograph helps one to decide about such resistances and to determine the conductance for use in calculating the overall heat transfer coefficient.

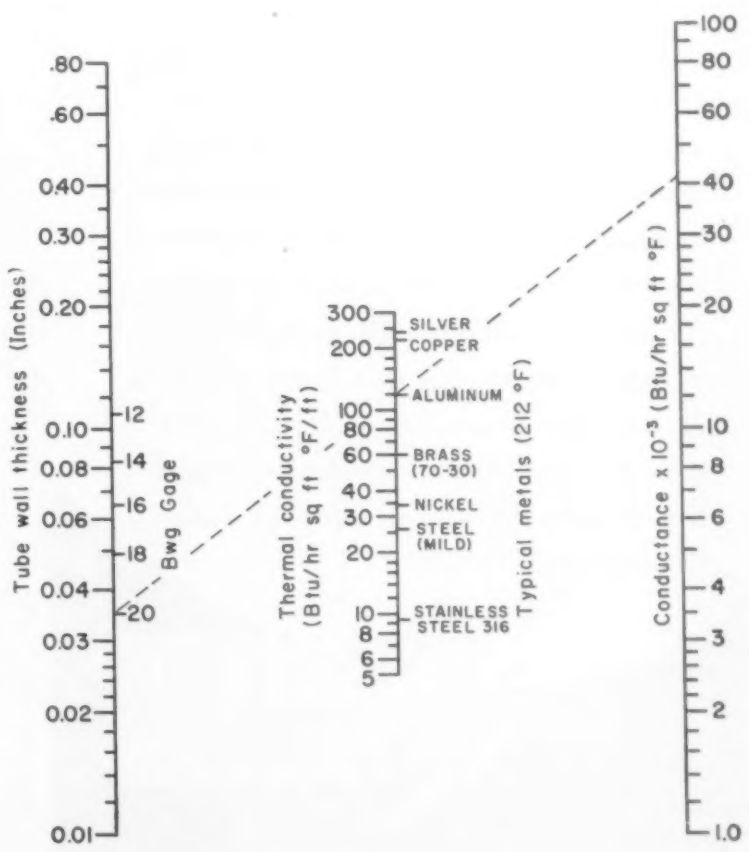
Conductance is product of thickness of the tube-wall and thermal conductivity[1] of the metal at the applicable temperature, which in this case is 212 F.

Typical Example

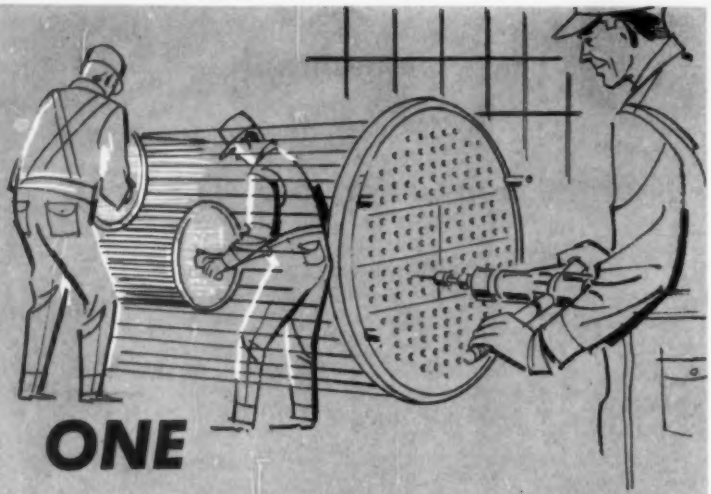
Index line shows that conductance of No. 20 BWG aluminum tubing with wall thickness of 0.035" and thermal conductivity of 119 Btu (hr) (sq ft) (°F/ft) is 41,000 Btu/ (hr) (sq ft) (°F).

LITERATURE CITED

1) PERRY, J. H., "Chemical Engineers' Handbook," p 456, McGraw-Hill Book Co., Inc., New York (1950)



Courtesy of Chemical Processing



ONE

AIRETOOL—EQUIPPED WORKER OUTPERFORMS 2 MEN WITH ORDINARY TOOLS

There's a lot of power built into Airetool tube maintenance tools. Plenty of reserve power, too, in order to keep work moving ahead . . . ahead of schedule. Airetool designs its equipment to give you all the capacity needed to save minutes or hours on the job. For instance, with Airetrol automatic tube expansion control, one man easily rolls up to 12 tubes per minute with accuracy to .001 inch. In many cases, one Airetool-equipped worker out-produces two men with ordinary tools. Write for Bulletins.

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Circle 9322 opposite covers.

NEW LITERATURE

Stainless-steel fittings in 86 pages

Both IPF and Tube OD welding fittings, screwed and socket-welding fittings, and ASA, MSS and "corrosion weight" flanges are detailed in 86-page master reference volume.

Technical section includes data on manufacturing standards, specifications, welding, and corrosion resistance tables.

Catalog is well balanced and tab-indexed for quick reference.

(Stainless-steel fittings cat is issued by Ladish Co., Dept. PI, Cudahy, Wis.)

Circle 9323 opposite covers.

Explains excitation system for AC generator control

A dual-mode excitation system for AC generator control is explained in a four-page bulletin.

Circuit schematics explain principles of operation.

The device combines advantages of both the buss- and self-modes of excitation.

Added to the exciter of an AC generator set, it gives fast response, extra power when needed, improved stability and increased regulator life.

(Copies of Bul 8.010 is available from Electric Regulator Corp., Dept. PI, Pearl St., Norwalk, Conn.)

Circle 9324 opposite covers.

Over 1500 electrical devices listed

Illustrations of over 1500 electrical wiring devices, lamps and specialty products are illustrated in this 76-page catalog.

All products are grouped in categories, cross-indexed to facilitate finding. Many illustrations are in color.

(Eagle Catalog is issued by Eagle Electric Mfg. Co., Inc., Dept. PI, 23-10 Bridge Plaza South, Long Island City 1, New York.)

Circle 9325 opposite covers.

Shows water-cooled air compressors

Twelve-page bulletin contains many illustrations of typical applications, cutaway drawings, and assemblies from line of two-stage, water-cooled air compressors.

General data is presented in convenient table form.

(Bul WB10 is issued by Gardner-Denver Co., Dept. PI, Quincy, Ill.)

Circle 9326 opposite covers.

Describes valve types for instrument lines

Four-page data sheet gives features, application information, pressure-temperature range, and specifications of line of valves for instrument piping and other use.

Illustrations and sectional drawings help illustrate how these valves combine unions, nipples, reducers, elbows, tees, valve and pressure bleeder valve in a space-saving unit.

(Unit #302 is issued by Jerguson Gage & Valve Co., Dept. PI, 80 Adams St., Burlington, Mass.)

Circle 9327 opposite covers.

"I knew it — we spend thousands for TV and all we get is cheap comedians."

Would you like to receive POWER INDUSTRY regularly?

If you are not already receiving POWER INDUSTRY personally, fill in the information called for below. If you qualify as an executive or engineer who manages power services, you will be added to our circulation list without payment of any formal subscription price.

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Describe job function and responsibilities:
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Number of persons employed in plant .....
Check off all categories that apply to you:
.....**Manufacturing plant**
.....**Utility**
.....**Service industry or institution**
.....**Consulting or construction engineers**
.....**Engineering headquarters of multiplant firm**
.....**Government installation**
.....**Other** .....
Equipment ratings:
Boilers: Number .... Total Capacity: ..... lb/hr
Total connected electric load .....kva
Total transformer capacity .....kva
Total number electric motors .... Total hp ....
Total number pumps ..... Total hp .....
Total number compressors ..... Total hp ....
Products manufactured .....
Signed .....
Date .....

Chart to raise numbers to fractional powers

J. G. LOWENSTEIN
Fairchild Chemical Division
Food Machinery and Chemical Corp.

Chart solves the equation:

$$f(n) = n^x$$

for positive powers between 0 and 1.0, and, as presented, for base numbers from 1 to 1000. The graph can be extended to include larger numbers.

Chart is sufficiently accurate for most calculations and eliminates need for slide-rule or log tables for this type of computation.

To use, draw a diagonal line from the base number on the vertical (n) scale to zero on the horizontal (x) scale.

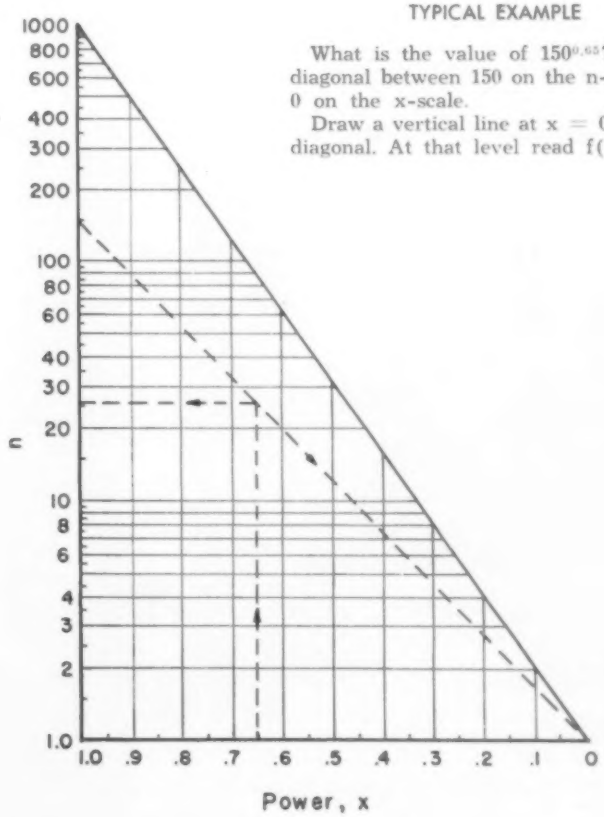
Raise a perpendicular from the desired power on the x-scale to this diagonal, then extend a horizontal line from the intersection point to the n-scale.

Read f(n) at this point.

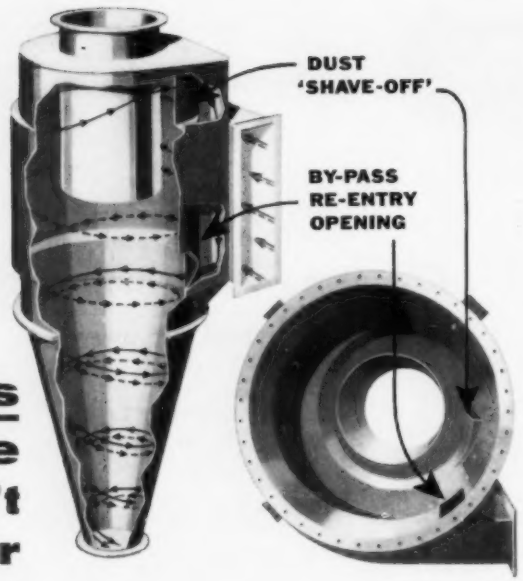
TYPICAL EXAMPLE

What is the value of $150^{0.65}$? Draw a diagonal between 150 on the n-scale and 0 on the x-scale.

Draw a vertical line at x = 0.65 to the diagonal. At that level read f(n) = 26.



Courtesy of Chemical Processing

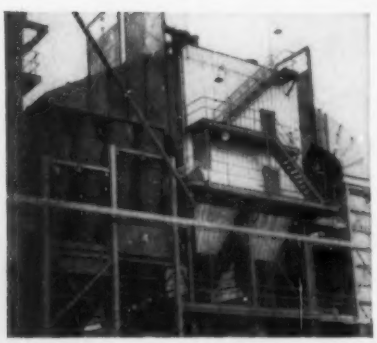


This Cyclone won't clog or plug

Buell's exclusive 'Shave-off' design permits large diameter cyclones that will not clog, plug, or bridge when properly operated: you avoid unnecessary maintenance work or process interruptions.

The unique Shave-off port traps the dust that whirls upward in double-eddy currents, increases cyclone efficiency by eliminating this source of dust reentrainment. Whether installed singly or in groups, Buell Cyclones are the most efficient ever developed.

Other features include extra heavy plate construction for longer service life, Buell-designed manifolds for more efficient, nonturbulent flow of dust-laden gases . . . and the confidence assured by a history of hundreds of installations everywhere in America. Write for a copy of the 12-page booklet, "The Exclusive Buell Cyclone": Dept. 90-L, Buell Engineering Company, Inc., 123 William St., New York 38.



Large-diameter Buell Cyclones in series with Buell 'SF' Electric Precipitator.

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

Circle 9328 opposite covers.

NEW LITERATURE

Stainless steel tubing for heat exchangers

Four-page bulletin explains how welded stainless steel heat exchanger condenser tubes are made. It also points out the fabrication and service advantages of using fully annealed tubing.

Illustrations aid in the descriptions.

(TB-415 is issued by Tubular Products Div., Babcock & Wilcox Co., Dept. PI, Beaver Falls, Pa.)
Circle 9329 opposite covers.

Lists pumps for handling large volumes

Twelve pages in two colors describe axial and mixed-flow, vertical and horizontal pumps designed to handle extremely large volumes of liquids with low and medium heads. Catalog lists units of capacities from 5000 to 200,000 gpm.

To assist in proper applications, construction and design details, station arrangement suggestions and illustrations of a number of typical installations have been included.

(Cat G-100 is available from Economy Pump Div., C. H. Wheeler Mfg. Co., Dept. PI, 19th and Lehigh Ave., Philadelphia 32, Pa.)
Circle 9330 opposite covers.

Electrical control centers — inside and out

Exteriors and interiors of electrical control centers are just some of the illustrations in 2-color, 4-page brochure.

General features, construction, parts, and dimensions are described for the two major components of the control centers — structural sections and electrical units.

Bulletin is three-hole punched for insertion in loose leaf notebook.

(Bul 2-2000A is issued by Federal Pacific Electric Co., Dept. PI, 50 Paris St., Newark 1, N. J.)
Circle 9331 opposite covers.

Shows how to control materials in motion

Photographs, operational data, and design features of twelve varied products for positive control of moving materials are contained in eight-page bulletin.

Items described are: a lightweight, plastic insert-type flow tube for metering water, gases, slurries, Venturi tubes; Venturi nozzle for high pressure fluid metering; transistorized systems for multifunction central supervisory control of distant processes and pipelines; and velocity-type liquid flow meters.

(Bul 100-R5 is issued by B-I-F Industries, Inc., Dept. PI, 345 Harris Ave., Providence 9, R. I.)
Circle 9332 opposite covers.

Water tube package for any fuel

Featured in 20-page catalog is a packaged two-drum water-walled steam generator for oil, gas, or coal.

Unit comes complete, ready to go to work as oil-gas fired unit, and can later be converted to stoker firing.

Also included is complete data on a factory-built or field-erected steam generator for any firing method.

Design and construction of these two types of boilers are shown in great detail with complete engineering data.

(Catalog SB57E is issued by Erie City Iron Works, Dept. PI, Erie, Pa.)
Circle 9333 opposite covers.

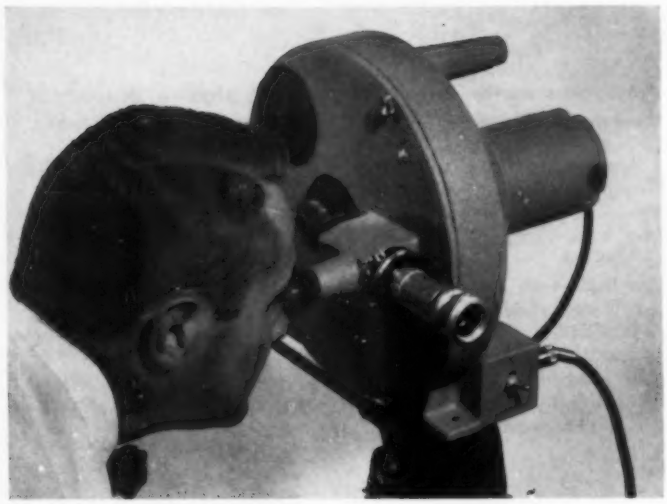
Removes moisture from electrical lines

Breathers and drains remove moisture from electrical systems.

This two-page bulletin explains how this equipment works and how they will prevent formation of mildew in explosion-proof equipment.

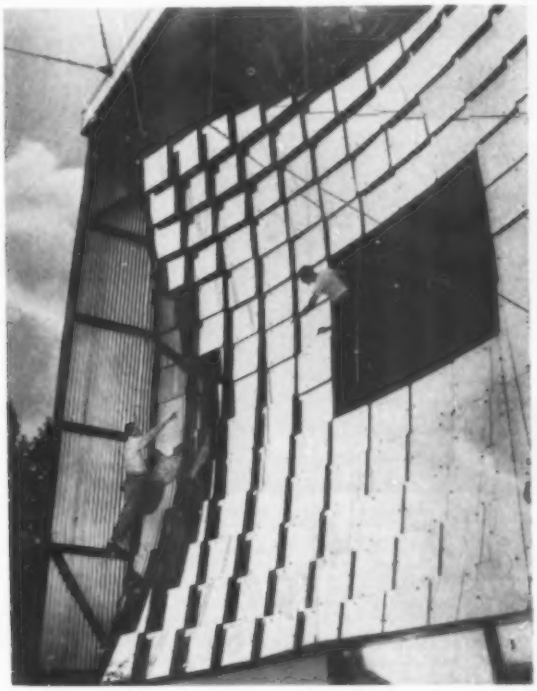
(Bulletin 2702 is issued by Crouse-Hinds Co., Dept. PI, Syracuse 1, N.Y.)
Circle 9334 opposite covers.

PHOTO NEWS

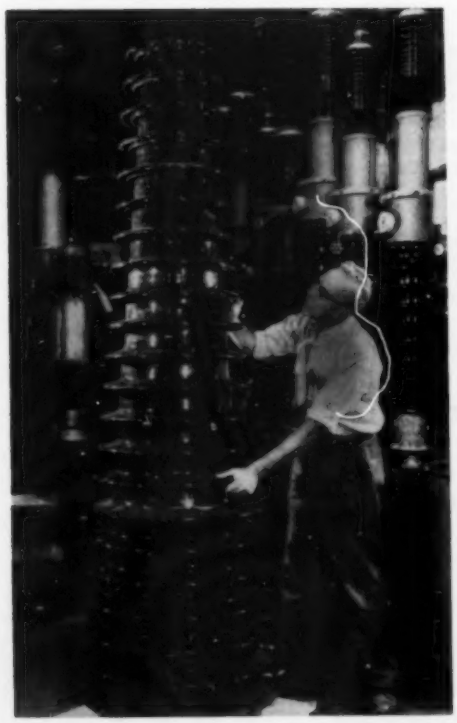


REAL HIGH SPEEDS can be recorded by this camera. Providing high-speed motion-analysis photographs at an upper rate of 25,000 16-mm frames per second, the light-weight, portable instrument uses standard 35-mm film. Exposure times are easily adjustable between 1 and 5 micro-second.

(Dynafax Camera is manufactured by Beckman & Whitley, Inc., Dept. Pl, 973 E. San Carlos Ave., San Carlos, Calif.) Check 9335 on Reader Service Cards.

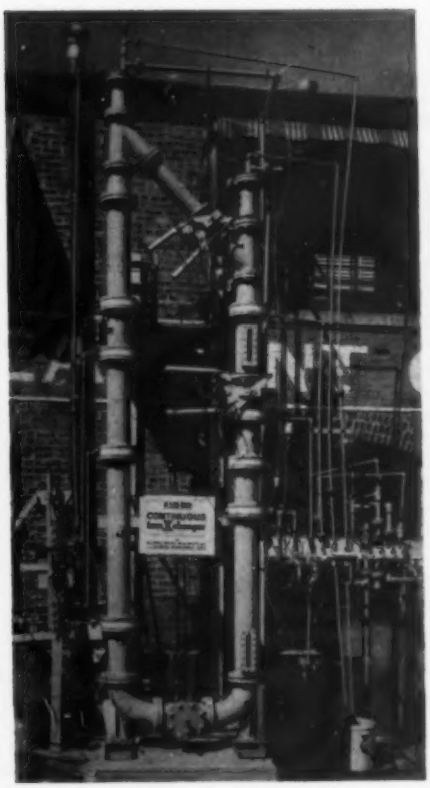


LESS HEAT LOSS by absorption will make this front-surface mirror more efficient than previous solar furnaces. Although designed for high thermal flux, rather than high temperature, a sample exposed to the furnace's concentrated energy should reach 5000°F at image position. The concentrator consists of 180 spherical mirrors manufactured by American Optical Co. Each mirror is two ft square



AMONG THE LARGEST ELECTRICAL PORCELAIN PIECES ever manufactured are these one-piece 345-kv bushing weathercasings manufactured by Westinghouse Electric Corp. Replacing two-piece units, the weathercasing measures 102⅞ inches long and 29¾ inches at their largest diameter

CONTINUOUSLY OPERATING ION-EXCHANGER has been designed by and is working at Illinois Water Treatment Co. Designed for interrupted service in uranium ore purification, the unit accomplishes its job with only a fraction of resin required for same result with fixed-bed equipment



LARGE NUMBER OF IMPROVEMENTS have been incorporated in design of direct-current motors manufactured by General Electric Co. for metal-rolling mills. Pictured here, the nine-ft rotor is force ventilated in both 40° and 50°C ratings. Other features include quick removable covers, constant-pressure brush holders, and inspection light and utility outlets conveniently located inside the motor

NOW-Steam Atomizing
WITH
NATIONAL AIROIL
Packaged Firing Units
FOR OIL AND/OR GAS FUELS

AUTOMATIC
ECONOMICAL
CLEAN . . . SAFE

● Fully Automatic ● Low Fire Start ● Electric-gas Ignition ● Modulating Fire Control ● Damper Sequence Control ● Forced Draft Combustion Air ● Electronic Combustion Safety Supervision ● Mechanical Atomizing—Steam assisted internal mixing oil burner ● Ring or Cylindrical type Gas Burner for gas fuel ● Fire tested before shipment.

NOW . . . with the new Series 20 Packaged Firing Unit you can have all the advantages of the outstanding Dual Stage burner in a completely packaged unit equipped with the latest in electronic safety controls to give *automatic* start, *automatic* modulation, *automatic* shutdown.

Series 20 Packaged Firing Units are factory fire tested, ready for immediate and low cost installation in your furnace room. They need only oil, gas, steam, draft and electrical connections—everything else needed for fully automatic burner operation is there.

Capacities of standard units range from 200 to 830 boiler horsepower. (7,200 to 30,000 pounds of steam per hour). Larger units are available on order to meet your special needs.

Units may be used with any standard boiler or furnace under natural or induced draft, or with pressurized boilers —in which case the unit provides sufficient forced draft to overcome draft loss through boiler. Where a high chimney or induced draft fan is used, an automatic damper motor is furnished to provide a constant furnace draft during operations; and a reduced or zero draft during shutdowns.

Preventative Maintenance consists chiefly of keeping the burner gun clean, with periodic inspection and cleaning of strainers and safety devices. This minimum maintenance will give your engineer or fireman extra time to attend to blow-down, soot-blowing, or to check operations and efficiency of plant and auxiliary equipment.

For complete details, specifications, illustrations, and dimensions write today for Bulletin No. 28.

When used in conjunction with a National Airoil Fuel Oil Pumping and Heating Unit (Bulletin No. 40) a most reliable combination results.

NATIONAL AIROIL BURNER COMPANY, INC.

1350 E. Sedgley Ave., Philadelphia 34, Pa.
S. W. Division: 2512 So. Blvd., Houston 6, Texas

Circle 9336 opposite covers.

NEW LITERATURE

How to design, use feedwater treatment

Technical paper entitled "Feedwater Equipment Designs and Methods" discusses in detail two main methods of treating boiler feedwater for industrial applications: hot process-hot zeolite and demineralization.

Latest developments in the design of equipment and components are cited and typical case histories are described. The eight-page paper is illustrated with flow diagrams and charts.

(Technical reprint T-161 is issued by Graver Water Conditioning Co., Dept. PI, 216 W. 14th St., New York 11, New York.)
Circle 9337 opposite covers.

Pictures solenoid valves

Basic types of solenoid valves plus twelve special variations are listed in four-page bulletin.

Featured are line of stainless steel valves in sizes of ½ to 2" and a series of models having four independent controls for variable opening and closing speeds, flow control and manual opening.

(Bul 500 C is issued by J. D. Gould Company, Dept. PI, 47-07 Massachusetts Ave., Indianapolis 18, Ind.)
Circle 9338 opposite covers.

Insulation adhesives extensively described

Insulation adhesives, weather-proofing, coatings, vapor barriers, and sealing compounds are subject of extensive bulletin.

Included are facts on applications, properties, temperature ranges, coverage per gallon, and suggestions on how to use product that is correctly engineered for each particular job.

(Bul I-C 58 is available from Insul-Coustic Corp., Dept. PI, 42-23 54th Road, Maspeth 78, N. Y.)
Circle 9339 opposite covers.

Announces motor-driven frequency changers

Synchronous motor-driven frequency converters with 400-cycle, three-phase output and with capacities as large as 250 kw are announced in two-page data sheet.

Dimension drawing and specifications are given.

(Form MG658 is issued by Kato Engineering Co., Dept. PI, Mankato, Minn.)
Circle 9340 opposite covers.

Colorfully describes original drives

Sixteen pages of full-color photographs describe and show application line of drives, which provide precise, adjustable machine speeds from in-plant AC circuits.

Also covered are manufacture and functions of the drive components, including regulators, exciters, motor-generator sets, operator's panels and motors.

Condensed specification, dimensions and accessories are also listed.

(Bul D-2506 is issued by Reliance Electric and Engineering Co., Dept. PI, 24701 Euclid Ave., Cleveland 17, Ohio.)
Circle 9341 opposite covers.

"Let's do it by a process of elimination — We'll connect 'em in various patterns 'til it works or shorts out."

Gives physical properties of glass fiber insulation

For temperature applications ranging from sub-freezing to 350°F, eight-page folder tells how to use light plate glass fiber pipe insulation.

Besides physical properties, folder also includes comparison of other insulations' thicknesses required for equal efficiencies, guide to specifications for application and finishing, and dimensions.

Instructions on installation are given.

(Form WPM-2 is issued by L. O. F Glass Fibers Co., Dept. PI, 1810 Madison Ave., Toledo 1, Ohio.)
Circle 9342 opposite covers.

Regulates feedwater

A single-element unit employing a thermostatic-tube level controller which actuates a regulating valve in the feedwater line is subject of four-page bulletin.

The regulator is suited for boilers carrying reasonably steady loads of steam pressures from 10 to 785 psig.

The bulletin illustrates working parts, and a schematic diagram shows how different units are arranged into a complete control system.

(Bul 1044 is issued by Copes-Vulcan, division of Blaw-Knox Co., Dept. PI, Erie 4, Pa.)
Circle 9343 opposite covers.

Tells how to prevent calcium scale

Four-page bulletin discusses phosphates for preventing calcium scale and controlling magnesium deposits.

In addition to discussion on methods of feeding chemicals and testing controlling residual phosphate, the brochure contains five case histories to describe the products in use.

(Bul HSP-906 is issued by Dept. 410, Hagan Chemicals & Controls, Inc., Dept. PI, Box 1346, Pittsburgh 30, Pa.)
Circle 9344 opposite covers.

Gives full story of ion exchange

Explaining the ion-exchange method of water conditioning, 60-page handbook discusses softening, dealkalizing and demineralizing processes from the standpoint of equipment and chemicals.

There are sections on definitions, flow diagrams, and numerous tables.

(Bul Z-5 is issued by National Aluminate Corp., Ion Exchange Div., Dept. PI, 6218 West 66th Place, Chicago 38, Illinois.)
Circle 9345 opposite covers.

Line of remote controls described in full

Four pages of illustrated applications start out this 16-page bulletin on line of remote controls.

The rest of the booklet is devoted to giving description and specification on five sizes to handle light to heavy loads.

Controls are of the flexible cable mechanical type.

("Push-Pull Flexible Controls" Bul is issued by Automotive and Aircraft Division of American Chain & Cable Co., Dept. PI, 601 Stephenson Bldg., Detroit 2, Mich.)
Circle 9346 opposite covers.

A how-to book on water heating

"How to Design, Specify and Buy Large Volume Water Heating Systems" is subject of 24-page book.

This handy reference book contains full instructions, tables and charts to simplify estimating water heating requirements for various commercial installations.

It also details controls, safety devices and accessories required for of system.

("How to Design, Specify and Buy Large Volume Water Heating Systems" is issued by The Cleveland Heater Co., Dept. PI, 2310 Superior Ave., Cleveland 14, Ohio.)
Circle 9347 opposite covers.

What good is *specialized* business publication advertising?

No one is in a better position to give a hard-boiled, practical answer to this question than the men who spend their working lives on the sales front . . . the men the ads are supposed to help . . . the men who sell.

Here is the statement of a salesman who knows what advertising does for him when it appears in the industrial, trade or professional publications that serve the specialized market to which he sells:

Chester Burt
American Hard Rubber Co.

Sells industry

Says Mr. Burt: "After some years as an inside man at American Hard Rubber, I'm taking on my first sales territory and believe me, I'd be worried if I didn't have good leads from our business paper advertising. They give me something to latch on to. With an advertising lead as a start I find there's a better possibility of something coming from a call than if I made a cold call.

"For one thing, even if the man who sent in the inquiry isn't in a very important position in the company, at least the inquiry gets me through the door and once I'm inside I can work it out.

"Another thing I've found is that I can do a better job of planning my trips if I have some advertising leads. More worthwhile calls can be scheduled and it's possible to accumulate leads to make a profitable trip to out-of-the-way areas. Of course, on top of all this, I think that in many cases where I've gotten business, trade advertising has reached some of the people inside that I can't see; like people who leave it to others to interview salesmen, but still have to give the final okay themselves."

Why not ask your own salesmen what your company's business publication advertising does for them. If their answers are generally favorable you can be sure that your business publication advertising is really helping them sell. If too many answers are negative it could well pay you to review your advertising objectives—and to make sure the publications that carry your advertising are read by the men who must be sold.

POWER INDUSTRY

NBP

One of the 207 members of National Business Publications, Inc. . . . each of which serves a specialized market in a specific industry, trade or profession.

Government Research

From page 11

the system will perform satisfactorily, even though there are many joints conveniently made under non-ideal circumstances.

Research on valves for the Navy has enabled manufacturers to improve the already high quality of the valves for power uses. The rigid inspection methods required for valves and pumps for submarines have, for the most part, been extended to those for power plants.

Impact on Manufacturing

Few realize the degree of perfection required to meet the requirements of Government contracts. The castings and forgings must approach perfection. These are inspected with huge betatrons which create rays that will penetrate thick steel in seconds.

The machining is to close tolerances and the parts are run under conditions of use before they are shipped. All this is expensive, but it teaches lessons that can also be used in designing and making valves for industry.

More Control

Then there have been new standards of temperature control and room cleanliness developed so that extremely precise instruments and components can be made and assembled. These rooms have to be kept dust-free as a result of purification with electrostatic precipitators.

The machine and equipment parts are inspected for traces of grease or organic material with black light. The accuracy of the parts are tested with precision electrical instruments. Some rooms are even free of bacteria, which results in about the ultimate in environment conditioning.

Stimulated by Government-financed research, there is no doubt that the new environments in which we are working — and will work — will be created and controlled in accordance with our own designs to satisfy our needs and whims. The abilities which we as individuals possess are increased many times through the use of electrical power and the extension of the abilities of even masses of men to control their own environment, including even the weather, is almost within our grasp. ◆

M-G sets

From page 15

tion along with very rapid response a special generator called an amplidyne is frequently used in a motor-generator set. In this type of generator a few milliamps of field power control kilowatts of output.

Ripple Voltage

In some applications the magnitude of ripple in the DC power output is important. In these applications motor-generator sets are specified because DC generators inherently have a very low ripple in comparison to rectifiers. Special generator designs are available to further minimize the ripple voltage.

Motor-generator sets will stand much abuse. Some manufacturers' direct current generators have a 300% short time overload capacity as a standard feature. Even with unexpected severe overloads that cause a generator flashover, the damage can usually be repaired without major overhaul, and the generator put back in use quickly.

Generators can withstand voltages well above their own voltage rating. Sometimes in the application of DC power for synchronous motor or generator fields, a high voltage transient developed in the synchronous machine can be reflected back to the power source. If the power source is a motor-generator set it can probably take the abuse without damage.

(Standard and special motor-generator sets are manufactured by General Electric Co., Dept. PI, 1 River Road, Schenectady 5, N. Y.)
Circle 9348 opposite covers.

advertisers' index

A

Airetool Manufacturing Company 28

B

Bailey Meter Company ..... 2nd Cover
Buell Engineering Company, Inc. 30

C

Chapman Valve Manufacturing Co., The 18-19
Cobra Metal Hose 21
Crane Co. ..... 3rd Cover

F

Federal Sign and Signal Corporation 27

G

Globe Company, The, Products Division 23

H

Hays Corporation, The 5
Hungerford & Terry, Inc. 27

I

Illinois Water Treatment Co. 7

J

Johnson Corporation, The 8

K

Kirk & Blum Mfg. Co., The 6

L

Liquidometer Corp., The 26

N

National Airoil Burner Company, Inc. 32
National Boiler Protector Co. 29
National Business Publications, Inc. 33
Neff & Fry Company 8
New York & New Jersey Lubricant Company 8

P

Peabody Engineering Corporation 4
Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation 17
Pickands Mather & Co. 7
Putman Publishing Company 13, 29

R

Ranney Method Water Supplies, Inc. 25

V

Vogt Machine Company, Henry ..... 4th Cover

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THAT'S INTERESTING

Jumpy reactor

Problems of designing a boiling water reactor are not all nuclear. Drs. Thie and Snyder of Argonne recently gave a paper describing the jumpy state of "percolator" resonance in early designs.

The problem: fuel elements submerged in water brought it to a boil. As a large volume of steam formed, it made neutrons unavailable for continuing the reaction. Thus as steam rose through the water, new steam formation fell to a minimum. As soon as all the steam bubbles had left the fuel area, reaction resumed.

Result was a thumping percolator action at about one spurt per second.

Extensive mathematical analysis plus experiments have now beaten the problem.

Sun's light — indoors

Special installation of more than 150 spotlights produced 10,000 footcandles of light for the first time indoors — a footcandle total equal to the level that the sun delivers to the earth's surface.

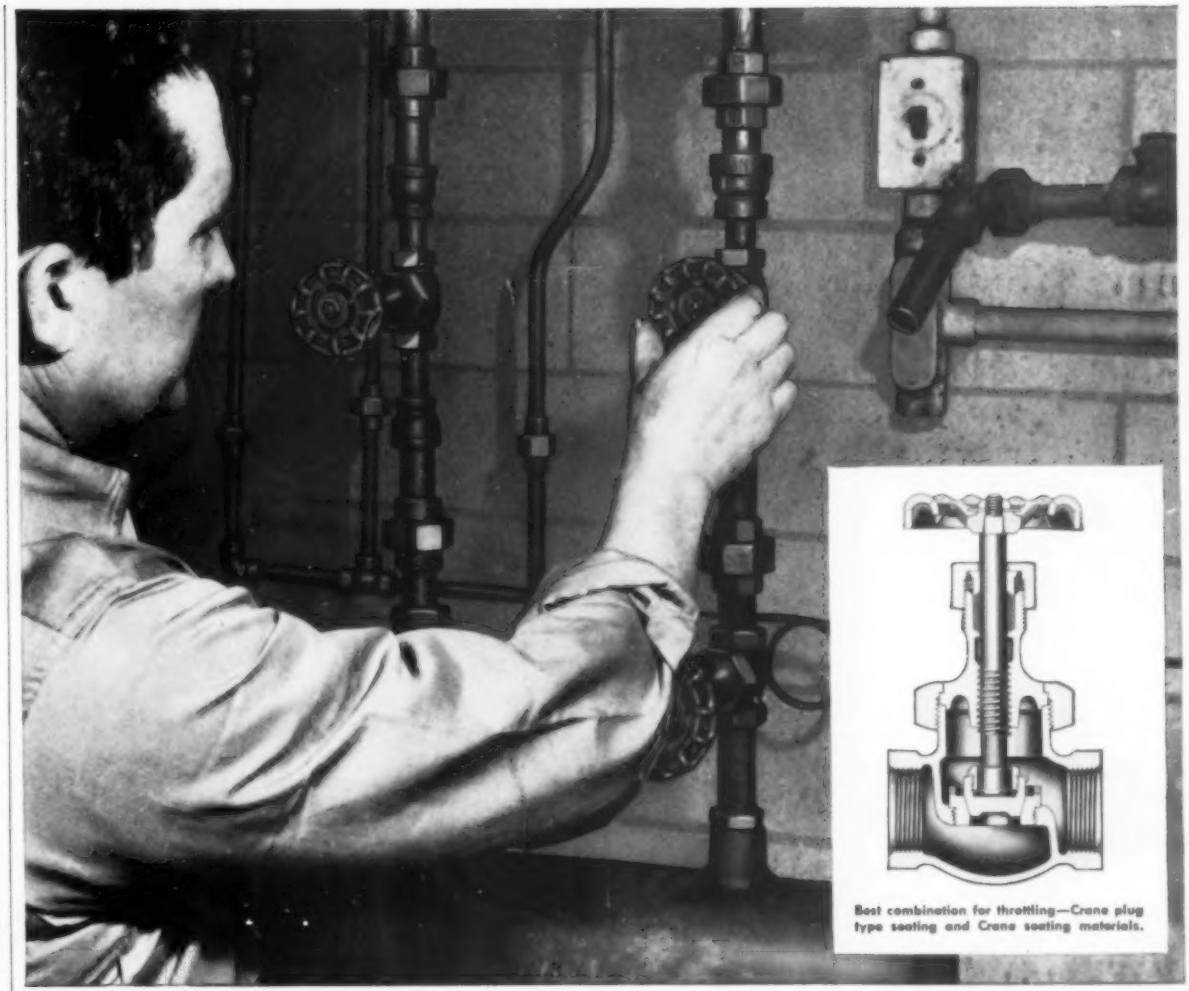
Matching the sun's light indoors made lighting history as a climax of the dramatized 1958 Progress Report of the Illuminating Engineering Society at Toronto, Ontario.

Electronic earmuffs

Electronic earmuffs for soldiers create artificial quiet amid roar of combat. They are a development of the Army and Radio Corporation of America.

Artificial quiet is created by adding more noise. A miniature microphone in special earpiece creates a second noise — just as loud, but opposite in phase.

When two sound waves meet they dissipate their energy fighting each other. Result: loud roar muffled to a whisper.



Surprising savings for this power plant with Crane bronze throttling valves

At least once a year, this power plant of a leading machine tool builder was replacing the valves in the ½-inch continuous blowdown lines on its 60,000-pound boiler.

They were high-priced valves, but they couldn't take the continual throttling service. The seats cut out rapidly . . . blowdown regulation was lost . . . valve costs kept rising.

Thirty-one months ago this plant replaced the short-lived valves with Crane No. 212P, 200-pound bronze globe valves with plug type disc. Most of the time these Crane valves have been operating at less than half-open.

Yet, at every inspection to date, they've been found O.K.—no seat damage . . . no loss of regulation . . . no maintenance needed. Another proof of the economy of Crane quality!

To cut your valve and piping maintenance costs—on steam or any fluid—call in your local Crane Man. He has more to offer in money-saving piping materials.

COST-SAVING IDEAS FOR YOU in this free 36-page book of "Valve Performance Facts." Get your copy from your Crane Man or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Circle 9349 opposite covers.

"OUT IN THE OPEN"

Vogt

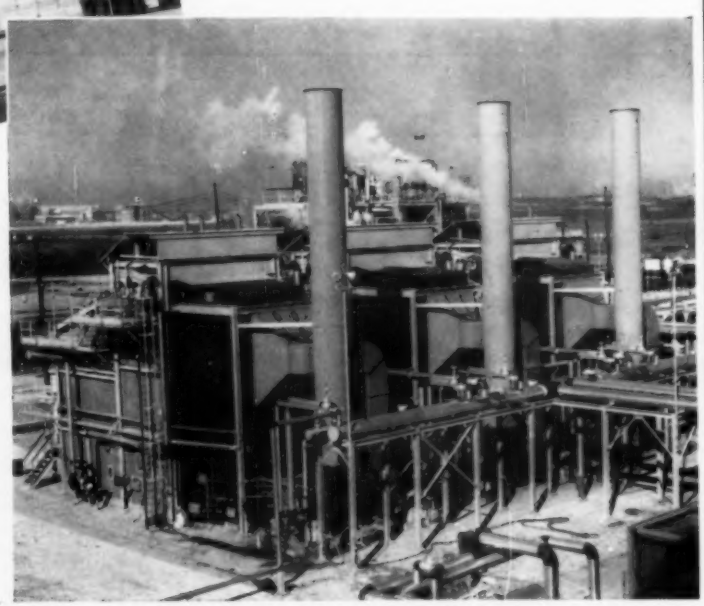
Steam Generators

STEAM GENERATORS for economical outdoor operation have been featured by Vogt for many years and serve leading chemical plants and petroleum refineries. Requiring no building for housing, such installations, as pictured here, produce more steam per dollar of investment and are a definite aid to lower production costs.

Get Vogt's recommendations for steam generators to meet your needs for power, processing, or heating, without obligation. Package type and custom built units are available in a wide range of types, capacities, and pressures to meet operating requirements.

Write for bulletins. Dept 24A-BIP

Three 85,000 #/hr. steam generators in a Texas refinery.



An outstanding chemical plant served by three 150,000 #/hr. units.

OTHER VOGT PRODUCTS

Drop Forged Steel Valves, Fittings and Flanges — Petroleum Refinery and Chemical Plant Equipment Heat Exchangers Ice Making and Refrigerating Equipment

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

SALES OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va., Cincinnati

Circle 9350 opposite covers.

POWER
PLANT & POWER SERVICES
INDUSTRY

Putman Publishing Company

CREATORS OF

READER ACTION

MAGAZINES

. . . featuring all these essential elements:

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- HAND-PICKED CIRCULATION
- "EXECUTIVE" FORMAT
- HIGH VISIBILITY
- QUALITY READERSHIP
- MORE READER ACTION